



ARTHROPOD-BORNE VIRUS INFORMATION EXCHANGE

Special Edition

January, 1978

SURVEY AND RECOMMENDATION REPORTS OF THE SUBCOMMITTEE ON ARBOVIRUS LABORATORY SAFETY

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* Refers to number in brackets [] at bottom of page.



The AMERICAN COMMITTEE ON ARTHROPOD-BORNE VIRUSES

SUBCOMMITTEE ON ARBOVIRUS LABORATORY SAFETY

7 December 1977

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Dear Colleague:

The Subcommittee on Arbovirus Laboratory Safety (SALS) of the American Committee on Arthropod-Borne Viruses has now completed an analysis of the questionnaire-survey which was sent to you last year. As a result of this and other information, SALS is developing proposals for safety concerning arboviruses, laboratory workers and the environment around them.

In this Special Issue of the Arthropod-borne Virus Information Exchange are presented SALS Survey and Recommendation Reports as of November 1977.

Since there currently is special concern in the United States of America regarding safety of working with arthropod-borne and certain other viruses of vertebrates, SALS has directed its recommendations specifically at the current U.S.A. situation. We realize that these recommendations therefore may not apply to other countries, but will appreciate your thoughts and advice concerning their soundness from scientific and public health viewpoints.

The recommendations of SALS are based on a) the survey analysis, b) much committee consideration, c) replies to a mini-trial mailing of tentative recommendations to members of the ACAV Executive Committee and the WHO regional laboratories of the world in Spring 1977, d) the latest draft (July 1977) of the CDC orange-yellow book on Classification of Etiologic Agents on the Basis of Hazard and e) the latest DNA recombinant recommendations from the NIH.

7 December 1977

It should be noted that SALS recommendations are so far limited to viruses listed in the Catalog as of 1976 when the survey was done. Since then, there have been new viruses and SALS will consider those in the future. They were not included now because of lack of sufficient information.

We now need your advice, criticisms and suggestions by 28 February 1978 before preparing the final versions of these Reports.

Thank you and best regards,

Cordially yours,



William F. Scherer, M.D.

WFS:s1

SALS

Survey report

November 1977

Survey Report

Table of Contents

- 1) Copy of the Survey-check list and the safety level descriptions used for the survey.
- 2) Tabulations of the numbers of replies to the survey by type of laboratory and by continent.
- 3) The method of calculating "experience" numbers.
- 4) Tables summarizing survey, Arbovirus Catalogue and published data for each virus.
- 5) Tables of recorded laboratory infections.

Check list to Arbovirus Investigators
concerning

Types of facilities used for arbovirus work

Column I. Mark x if your personnel have worked with the virus

Complete columns II-VI for each virus marked x in column I.

II. Indicate whether the virus has been handled in your laboratory:
a) 1, b) 2-20 or c) >20 times.

III. Indicate which type of facility was used for each virus: A or B or C or D or E or other. See attached sheet for descriptions of types A, B, C, D and E facilities and for space for you to describe other types of facilities.

IV. Mark x if the virus already exists in the natural environment within 50 kilometers of your laboratory.
Mark y if there is potential risk of establishing a natural focus of the virus in the region of your laboratory.
Leave blank if neither x or y.
Mark ? if knowledge is insufficient to mark x or y.

V. With respect to each virus and the time period(s) when you have handled each virus, indicate your best estimate of the numbers of persons in your laboratory who were

- a. at risk
- b. ill from infection
- c. developed antibodies without illness. Mark NT (not tested) if no antibody tests were done.

VI. Please comment on mechanisms and sources of laboratory infections, for example, accident, improper facility, aerosol, injection, laboratory animals, type of virus suspension, etc.

Name of laboratory _____ City _____ Country _____

Years covered by report: 19__ through 19__. Name of person preparing report _____

Virus name	I	II	III	IV	V			VI
					a.	b.	c.	
<u>Group A</u>								
Aura								
Bebaru								
Chikungunya								
Eastern equine enc.								
Everglades								
Getah								
Mayaro								
Middelburg								
Mucambo								
Ndumu								
O'nyong-nyong								
Pixuna								
Ross River								
Sagiyama								
Semliki Forest								
Sindbis								
Una								
Venezuelan equine enc.								
Western equine enc.								
Whatarca								

TYPES OF FACILITIES

A. Laboratory where no rigorous containment of viruses is provided.

B. Laboratory with virus containment as described. Personnel have special training for handling dangerous agents and are supervised by competent scientists. Personnel at risk are immunized against agents for which immune prophylaxis is available.

1. Work area is a controlled access facility separated from the activities of individuals not engaged in handling viruses and from the general traffic pattern of the rest of the building or laboratories.
2. Animal experiments, including cage sterilization; refuse handling and disposal of animals are conducted with a level of precaution equivalent to conditions required for laboratory experiments.

C. Same as B but also:

1. Negative air pressure is maintained at the site of work in a preparation cubicle or under a hood. Air is recirculated only after it has been adequately decontaminated through high efficiency filters.

D. Same as C but also:

1. Viruses are manipulated only in safety cabinets equipped with air exhausting through high efficiency filters.
2. Work areas are in a facility which is in effect a separate building or they are separated from other work areas by effective air locks. The entire area has a separate air-exhaust and negative pressure with respect to other areas of the building. Exhaust air is decontaminated by filtration through high efficiency filters or by some other suitable process.
3. When an agent is used in entomologic experiments, the windows, walls, floors, ceilings and air locks of the work area are insect proof.
4. Access to work areas is restricted to individuals immunized or otherwise under specific control.
5. Laboratory clothing is worn and is decontaminated before removal from the laboratory area. Showers may be required upon exiting.
6. All laboratory equipment and animal handling or holding equipment, including bedding and refuse that are removed from the laboratory, are autoclaved or specifically disinfected by a means appropriate for the virus or viruses being studied.

E. Same as D but also:

1. All work with virus is done in airtight hoods or cabinets by means of gloves or mechanical devices. The hoods or cabinets exhaust to an incinerator or high efficiency filter. Alternatively this work can be done in a specifically designed containment room wherein the operator wears a pressurized, nonporous plastic suit. The outside of the suit is decontaminated in an air lock when the operator exits from the room. Room air is negative to the air lock and adjoining laboratory, and all air is exhausted through high efficiency filters.

If you use a facility different from type A, B, C, D, or E as described above, please describe it in the following space and indicate it as "other" in column III of the check list.

Check list to Arbovirus Investigators

Name of laboratory _____

City _____

Country _____

Virus name	I	II	III	IV	V			VI
					a.	b.	c.	
<u>Group B</u>								
<u>Mosquito-borne</u>								
<u>Alfuy</u>								
<u>Banzi</u>								
<u>Bouboul</u>								
<u>Bussuquara</u>								
<u>Benque-1</u>								
<u>Denque-2</u>								
<u>Denque-3</u>								
<u>Denque-4</u>								
<u>Edge Hill</u>								
<u>Ilheus</u>								
<u>Japanese encephalitis</u>								
<u>Jugra</u>								
<u>Kokobera</u>								
<u>Kunjin</u>								
<u>Murray Valley enceph.</u>								
<u>Ntaya</u>								
<u>Sepik</u>								
<u>St. Louis encephalitis</u>								
<u>Spondweni</u>								
<u>Stratford</u>								
<u>Tembusu</u>								
<u>Uganda 5</u>								
<u>Usutu</u>								
<u>Wesselsbron</u>								
<u>West Nile</u>								
<u>Yellow fever</u>								
<u>Zika</u>								
<u>Tick-borne</u>								
<u>Absettarov</u>								
<u>Hanzalova</u>								
<u>Hypr</u>								
<u>Kadam</u>								
<u>Karshi</u>								
<u>Kumlinge</u>								
<u>Kyasanur Forest disease</u>								
<u>Langat</u>								
<u>Louping III</u>								
<u>Omsk hem. fev.</u>								
<u>Powassan</u>								
<u>Royal Farm</u>								
<u>RSSE</u>								
<u>Tyuleny</u>								
<u>No arthropod vector</u>								
<u>Apoi</u>								
<u>Batu Cave</u>								
<u>Carey Island</u>								
<u>Cowbone Ridge</u>								
<u>Dakar bat</u>								
<u>Entebbe bat</u>								
<u>Israel turkey meningo.</u>								
<u>Jutiapa</u>								
<u>Koutango</u>								
<u>Modoc</u>								
<u>Montana myotis leuko.</u>								
<u>Negishi</u>								
<u>Phnom-Penh Bat</u>								
<u>Rio Bravo</u>								
<u>Saboya</u>								
<u>Sokoluk</u>								

Name of laboratory _____

City _____

Country _____

Virus name	I	II	III	IV	V			VI
					a.	b.	c.	
<u>Bunyamwera supergroup</u>								
<u>Bunyamwera</u>								
Anhembi								
Batai								
Birao								
Bunyamwera								
Cache Valley								
Calovo								
Germiston								
Guaroa								
Ilesha								
Kairi								
Lokern								
Maquari								
Main Drain								
Northway								
Sororoca								
Tensaw								
Tlacotalpan								
Wyeomyia								
<u>BWAMBA GROUP</u>								
Bwamba								
Pongola								
<u>Group C</u>								
Apeu								
Caraparu								
Gumbo Limbo								
Itaqui								
Madrid								
Marituba								
Murutucu								
Nepuyo								
Oriboca								
Ossa								
Restan								
<u>CALIFORNIA GROUP</u>								
Bocas								
California Enc.								
Inkoo								
Jamestown Canyon								
Jerry Slough								
Keystone								
La Crosse								
Melao								
San Angelo								
Tahyna								
Trivittatus								
<u>CAPIM GROUP</u>								
Acara								
Bushbush								
Capim								
Gujara								
Juan Diaz								
Moriche								

Name of laboratory _____

City _____

Country _____

Virus name	I	II	III	IV	V			VI
					a.	b.	c.	
GUAMA GROUP								
Bertioga								
Bimiti								
Catu								
Guama								
Mahogany Hammock								
Moju								
KDONGOL GROUP								
Koongol								
Wonqal								
PATOIS GROUP								
Pahayokee								
Patois								
Shark River								
Zegla								
Simbu								
Aino								
Akabane								
Buttonwillow								
Inqwavuma								
Manzanilla								
Mermet								
Nola								
Oropouche								
Sabo								
Samford								
Sango								
Sathuperi								
Shamonda								
Shuni								
Simbu								
Thimiri								
TETE GROUP								
Bahig								
Hatruh								
Yete								
Tsuruse								
UNASSIGNED - "SBU"								
Botambi								
Gemboa								
Guaratuba								
Jurona								
Kaeng Khoi								
Minatitlan								
Mirim								

Name of laboratory _____

City _____

Country _____

Virus name	I	II	III	IV	V			VI
					a.	b.	c.	
<u>Bunyavirus-like</u>								
<u>Phlebotomus fever</u>								
Aguacate								
Anhanga								
Arumowot								
Bujaru								
Cacao								
Caimito								
Candiru								
Chagres								
Chilibre								
Frijoles								
Gordil								
Icoaraci								
Itaporanga								
Karimabad								
Nique								
Pacuf								
Punta Toro								
Salehabad								
SF-Naples								
SF-Sicilian								
<u>Tick-borne</u>								
<u>CHF-CONGO GROUP</u>								
Congo								
Hazara								
<u>GANJAM GROUP</u>								
Dugbe								
Ganjam								
<u>KAISODI GROUP</u>								
Kaisodi								
Lanjan								
Silverwater								
<u>THOGOTO GROUP</u>								
Thogoto								
<u>UUKUNIEMI GROUP</u>								
Grand Arbaud								
Manawa								
Ponteves								
Uukuniemi								
Zaliv Terpeniya								
<u>Minor groups</u>								
<u>ANOPHELES A GROUP</u>								
Anopheles A								
Lukunf								
Yacaiuma								
<u>ANOPHELES B GROUP</u>								
Anopheles B								
Boracea								
<u>BAKAU GROUP</u>								
Bakau								
Ketapang								

Name of laboratory _____

City _____

Country _____

Virus name	I	II	III	IV	V			VI
					a.	b.	c.	
<u>MAPPUTTA GROUP</u>								
<u>Mapputta</u>								
<u>Maprik</u>								
<u>Trubanaman</u>								
<u>TURLOCK GROUP</u>								
<u>M'Poko (=Yaba-1)</u>								
<u>Turlock</u>								
<u>Umbre</u>								
<u>Ungrouped-mosquito</u>								
<u>Rift Valley fever</u>								
<u>Tataguine</u>								
<u>Witwatersrand</u>								
<u>Ungrouped-tick</u>								
<u>Bhanja</u>								
<u>Lone Star</u>								
<u>Nairobi sheep disease</u>								
<u>Orbivirus</u>								
<u>Tick-borne</u>								
<u>KENEROVO</u>								
<u>Baku</u>								
<u>Bauline</u>								
<u>Cape Wrath</u>								
<u>Chenuda</u>								
<u>Great Island</u>								
<u>Huacho</u>								
<u>Kemarovo</u>								
<u>Lipovnik</u>								
<u>Mono Lake</u>								
<u>Okhotskiy</u>								
<u>Seletar</u>								
<u>Sixgun City</u>								
<u>Tribec</u>								
<u>Wad Medani</u>								
<u>Yaquina Head</u>								
<u>Minor groups</u>								
<u>AFRICAN HORSESICKNESS</u>								
<u>African horsesickness</u>								
<u>BLUETONGUE GROUP</u>								
<u>Bluetongue</u>								
<u>CHANGUINOLA GROUP</u>								
<u>Changuinola</u>								
<u>Iritufa</u>								
<u>CORRIPARTA GROUP</u>								
<u>Acado</u>								
<u>Corriparta</u>								
<u>EHD GROUP</u>								
<u>Epizootic hem. dis.</u>								
<u>EUBENANGEE GROUP</u>								
<u>Eubenangee</u>								
<u>Pata</u>								
<u>PALYAM GROUP</u>								
<u>D'Aquilar</u>								
<u>Kasba</u>								
<u>Palyam</u>								
<u>Vellore</u>								
<u>WARREGO GROUP</u>								
<u>Mitchell River</u>								
<u>Warrego</u>								

Name of laboratory _____

City _____

Country _____

Virus name	I	II	III	IV	V			VI
					a.	b.	c.	
<u>Ungrouped-mosquito</u>								
Japanaut								
Lebombo								
Umatilla								
<u>Ungrouped-tick</u>								
Colorado tick fever								
<u>Rhabdovirus</u>								
<u>KWATTA GROUP</u>								
Kwatta								
<u>MOSSURIL GROUP</u>								
Kamese								
Mossuril								
<u>VESICULAR STOMATITIS GR.</u>								
Chandipura								
Cocal								
Piry								
VSV-Indiana								
VSV-New Jersey								
<u>Ungrouped-mosquito</u>								
Flanders								
Hart Park								
Joinjakaka								
<u>Ungrouped-tick</u>								
Barur								
<u>Ungrouped-no arth.</u>								
Kern Canyon								
Lagos Bat								
Mount Elgon Bat								
Navarro								
<u>Arenavirus</u>								
Amapari								
Junin								
Lassa								
Latino								
Machupo								
Parana								
Pichinde								
Tacaribe								
Tamiami								
Lymphocytic chorio- meningitis								

Name of laboratory _____

City _____

Country _____

Virus name	I	II	III	IV	V			VI
					a.	b.	c.	
<u>Picornavirus-mosquito</u>								
<u>Nodamura</u>								
<u>Poxvirus-mosquito</u>								
<u>Cotia</u>								
<u>Iridovirus-tick</u>								
<u>African swine fever</u>								
<u>Paramyxovirus-no arth.</u>								
<u>Nariva</u>								
<u>Unclassified</u>								
<u>Tick-borne</u>								
<u>DERA GHAZI KHAN GROUP</u>								
<u>Abu Hammad</u>								
<u>Dera Ghazi Khan</u>								
<u>Kao Shuan</u>								
<u>Pathum Thani</u>								
<u>Pretoria</u>								
<u>HUGHES GROUP</u>								
<u>Hughes</u>								
<u>Punta Salinas</u>								
<u>Soldado</u>								
<u>Zirqa</u>								
<u>QALYUB GROUP</u>								
<u>Bandia</u>								
<u>Qalyub</u>								
<u>QUARANFIL GROUP</u>								
<u>Johnston Atoll</u>								
<u>Quaranfil</u>								
<u>SAKHALIN GROUP</u>								
<u>Avalon</u>								
<u>Clo Mor</u>								
<u>Sakhalin</u>								
<u>Minor groups</u>								
<u>BOTEKE GROUP</u>								
<u>Boteke</u>								
<u>Zingilamo</u>								
<u>MALAKAL GROUP</u>								
<u>Malakal</u>								
<u>Puchong</u>								
<u>MATARIYA GROUP</u>								
<u>Burg el Arab</u>								
<u>Garba</u>								
<u>Matariya</u>								
<u>NYANDO GROUP</u>								
<u>Nyando</u>								
<u>TIMBO GROUP</u>								
<u>Chaco</u>								
<u>Timbo</u>								

Name of laboratory _____

City _____

Country _____

Virus name	I	II	III	IV	V			VI
					a.	b.	c.	
<u>Ungrouped-mosquito</u>								
Arknam								
Aruac								
Bangoran								
Belmont								
Gomoka								
Ieri								
Kowanyama								
La Joya								
Minnal								
Nkoibisson								
Okola								
Pacora								
Tanga								
Tembe								
Trinifi								
Venkatapuram								
Wongorr								
Yata								
Zinga								
<u>Ungrouped various arthropod</u>								
Batken								
Charleville								
Chobar Gorge								
Dhorl								
Issyk-Kul								
Keterah								
Matucare								
Ngaingar								
Nyamaninfi								
Sawgrass								
Tett nang								
Upolu								
Wallal								
Wanowrie								
<u>Ungrouped no arthropod</u>								
Almpiwari								
Bangui								
Bimbo								
Gossas								
Kammavanpettai								
Kannamangalam								
Keuraliba								
Kolongo								
Landjia								
Le Dantec								
Marburg								
Marco								
Ouango								
Saint-Floris								
Sandjimba								
Sembalam								
Simian Hemorrh. fever								
Tanjong Rabok								
Thottapalayam								
Toure								
Yogue								

GENERAL QUESTIONS

1. Is a medical facility available to staff members who become ill with suspected laboratory acquired disease? _____.
 - a. Are the medical personnel knowledgeable about the viruses being studied and the diseases they cause? _____.
 - b. Is specific immune plasma or globulin stocked in your laboratory for any viruses? _____. If so which viruses? _____.
 - c. Is any containment provided in the medical facility for safety for the medical staff to prevent dissemination of the virus throughout the facility? _____.

2. Is any attempt made to monitor for seroconversion or illness due to the viruses being studied?
 - (1) laboratory personnel _____.
 - (2) family members or other contacts of staff personnel _____.
 - (3) vertebrates in the surrounding area _____.

3. Please indicate number of scientific and technical staff, by level of training, currently engaged in work on viruses listed in questionnaire.
Total staff _____
Doctoral degree _____
Master degree _____
Bachelor degree _____
Technical training without college degree _____

4. If any of the viruses in the check list unexpectedly infected animals in your laboratory in addition to or instead of persons, please indicate the viruses, animals, types and numbers, illnesses or inapparent infections and numbers of animals at risk. _____

5. Check in column II the immunizations given to your laboratory staff and complete columns III, IV and V for those immunizations:

I Virus vaccine	II	III Are antibody titers measured	IV Antibody test used	V Intervals of measuring antibodies
eastern encephalitis				
western "				
Venezuelan "				
chikungunya				
yellow fever				
Japanese encephalitis				
tick-borne "				
Names of others				

6. Additional information

Responses to questionnaire - survey concerning arthropod-borne and certain other viruses of vertebrates, 1976

Mailing list of recipient laboratories	Numbers of check lists (as of Oct 76)			Total % returned or acknowledged
	Mailed	Returned	Acknowledged, not returned	
ABV catalogue	155	61 (39%)	2 (1%)	40%
WHO	155	58 (37%)	6 (4%)	41%
Molecular virologists	128	28 (22%)	6 (5%)	27%
Arenaviruses	47	9 (19%)	2 (4%)	23%
Veterinary Schools	5	2 (40%)	0	40%
	<u>490</u>	<u>158 (32%)</u>	<u>16 (3%)</u>	<u>35%</u>

% of check lists sent to each continent which were returned
or acknowledged

Continent of recipient laboratory	% returned	% acknowledged, not returned	Total %
Africa	55%		55%
Asia	46%	5%	51%
Australia	75%		75%
Europe	21%	1%	22%
North America	40%	4%	44%
South America	36%		36%

Method of calculation of experience numbers (denominators in survey result table)

Facilities handling virus x	Persons at risk	Times virus x handled	Experience factor for virus x by laboratory
1.	1	20	20
2.	1	2	2
3.	6	2	12
4.	1	2	2
5.	6	20	120
6.	1	20	20
7.	6	20	120
8.	100	2	200
9.	6	20	120
10.	1	2	2
11.	21	20	420
12.	1	20	20
13.	6	2	12
14.	<u>21</u>	<u>20</u>	<u>420</u>
Totals	178	172	1,490

Total experience factor for virus x = 1,490

Virus name	Natural human disease in adults	Protective vaccine available	overt facility class/ Number/lab infections/experience by					Infections of susceptible personnel
			USPHS II SALS A	III B C	IV D E			
<u>Group A</u>	R= reported S= significant		() = inapparent infections					ABV Catalogue R= reported S= significant Number= overt cases Science 158:1283, 1967
Ayra			0/12	0/9	0/422	0/3	0/2	
Bebaru			0/124	0/250(1)	0/424	0/3	0/2	
Chikungunya	S	+	1/188 (1)	12/1628	1/1030	0/280	0/4	R 19
East rn Equine enc.	S	+	0/809	0/589	0/1131	0/1286(2)	0/907	R 2
Everglades	R		-	0/12	0/1276	0/422	0/2	
Getah			0/122	0/316	0/424	0/3	0/2	
Mayaro	S		1/44	0/185	0/559(1)	0/244	0/2	R 3
Middelburg			0/-	0/427	0/127	0/441	0/4	
Mucambo	S		0/420	0/268	0/566	0/124	0/2	
Ndumu			-	0/243	0/420	0/2	0/2	
O'nyong-nyong	S		0/1	1/319	0/620	0/32	0/2	
Pixuna			0/420	0/147	0/542	0/424	0/2	
Ross River	S		0/562 (5)	0/168	0/480	0/2	0/2	
Sagiyara			0/2	0/4	0/842	0/2	0/2	
Semliki Forest			0/771	0/728(1)	0/1314	0/160	0/4	R
Sindbis	R		0/535	0/2390	0/1245	0/162	0/706	
Una			-	0/22	0/566	0/3	0/2	
Venezuelan equine enc.	S	+	1/162	23/876	6/1026	0/1828(2)	0/2	S 118
Western equine enc.	S	+	0/1370	0/1679	0/1151	0/1245(2)	0/5	R 5
Rhataroa			0/120	0/4	0/420	0/2	0/16	
VEE (TC83)			0/540	0/420	0/582	0/20		

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Virus name	Natural human disease in adults	Protective vaccine available	overt facility class/ Number/lab infections/experience by					Infections of susceptible personnel
			JSPHS SALS	II A	III / B C /		IV / D E /	
<u>Group B</u> <u>mosquito-borne</u>	R= reported S= significant		() = inapparent infections					
Alfuy			0/132	0/132	0/424	-	-	
Banzi	R		0/1	0/122	0/560	0/20	-	
Boubouf			-	0/22	0/420	-	-	
Bussuquara	R		0/420	0/30	0/466	-	0/120	
Bergue-1	S		0/1182	0/3256	0/1046	0/260	-	R 6
Denque-2	S		0/761	3/3216	1/1608	0/280	0/2	
Dengue-3	S		0/543	1/1948	0/1062	0/52	-	
Dengue-4	S		0/402	0/1522	0/1062	0/52(1)	0/561	
Edge Hill			0/540	0/240	0/424	-	-	
Ilheus	R		0/420	0/189	0/652	0/2	-	R
Japanese encephalitis	S	+	0/1086	1/852(18)	0/1325	0/475(2)	-	R 1
Jugra			-	0/2	0/440	-	-	
Kokobara			0/240	0/12	0/422	-	-	
Kunjin			0/2	2/553(2)	0/894	0/2	-	R 2
Murray Valley enceph.	S		0/666	0/410(3)	0/569	0/122	-	
Nitaya			0/13	0/424	0/428	0/20	-	
Sepik	R		0/14	-	0/420	-	-	
St. Louis encephalitis	S		0/852(?)	1/3149	0/1098	0/822	0/3	R 1
Spondweni	R		-	2/384	0/424	0/2	-	R 2
Stratford			-	0/12	0/422	-	0/144	
Tembusu			0/122	0/25	0/462	-	-	
Uganda S			0/20	0/520	0/426	0/2	0/2	
Usutu			-	0/274	0/422	0/2	-	
Wesselsbron	R		-	4/420	2/544	-	0/20	R 4
West Nile	S		0/268	2/1796(1)	0/256	0/262	-	R 11
Yellow fever	S	+	0/18	0/2094	0/2142	0/700	0/4	S 38
Zika	R		0/122	0/566	0/483	0/22	-	R 1
<u>tick-borne</u>								
Absettarov	S		-	-	0/420	-	-	S
Hanzalova	S		-	-	0/420	-	-	
Hypr	S		-	3/264(6)	0/444	4/160(4)	-	S
Kadam			-	0/123	0/424	0/2	-	
Karshi			-	-	0/420	-	-	
Kimlinge	S		-	-	0/420	-	-	S
Kyasanur Forest disease	S		-	3/122(1)	0/422	0/8	-	S 65
Langat			0/154	0/440	0/528	0/542	-	
Louping ill	S	+	-	1/157(1)	0/482	0/6	-	S 21
Onsk hem. fev.	S		-	0/124	2/426	0/25	-	3
Powassan	S		0/562(?)	0/184	0/918	0/124	-	S 1
Royal Farm			-	0/22	0/422	-	-	
RSSE	S		-	0/136	1/446	1/29	0/2	S 18
Tyuleniy			-	0/32	0/446	-	-	

Virus name	Natural human disease in adults	Protective vaccine available	overt facility class/ Number/lab infections/experience by					Infections of susceptible personnel	
			USPHS II		III		IV		
			SALS	A	B	C	D		E
<u>No arthropod vector</u>			() = inapparent infections						
	R= reported S= significant								
Apoi			-		0/28	0/422	-	-	R
Batu Cave			-		0/2	0/440	-	-	
Carey Island			-		0/2	0/440	-	-	
Coubone Ridge			-		0/6	0/583	-	0/20	
Dakar bat			-		0/257	0/426	0/2	-	
Entebbe bat			-		0/122	0/426	0/2	-	
Israel turkey meningo.			-		0/2	0/422	-	-	
Jutipa			-		-	0/422	-	0/2	
Koutango			-		1/122	0/420	-	-	
Modoc			0/2(1)		0/448	0/494	0/1	-	
Montana myotis leuko.			-		0/6	0/446	-	-	
Regishi	R		-		0/44	0/424	-	0/2	R
Phnom-Penh Bat			-		0/21	0/420	-	-	
Rio Bravo	R		0/20(2)		0/42	0/460	0/2	-	R 5
Saboya			-		0/12	0/420	-	-	
Sokuluk			-		-	0/420	-	-	
<u>Bunyamwera supergroup</u>									
<u>Bunyamwera</u>									
Anhembi			-		0/2	0/420	-	-	
Batai			0/2		0/243	0/446	-	-	
Birao			0/22		0/943	0/697	0/143	-	
Bunyamwera	R		0/22		0/812	0/699	0/143	0/140	R 4
Cache Valley			0/274		0/400	0/610	0/121	-	
Calovo	R		0/120		0/240	0/426	0/140	-	
Germiston			0/440		2/176	1/468	0/1	-	R 3
Guaroa	R		0/440		0/156	0/468	0/1	0/20	
Ilesha	R		-		0/432	0/424	0/21	-	
Kairi			0/12		0/20	0/426	0/1	-	
Lokern			0/420		0/142	0/422	0/6	-	
Maguari			0/12		0/20	0/424	-	0/32	
Main Drain			-		0/562	0/422	0/12	-	
Northway			-		0/2	0/120	0/20	-	
Sororoca			0/6		0/41	0/420	-	-	
Tensaw	R		0/2		0/294	0/454	-	0/42	
Tlacotalpan			-		0/24	0/420	-	-	
Wycomyia	R		-		0/144	0/470	0/1	-	
Betiefe			-		-	-	-	0/2	
Taissui			-		-	-	-	0/2	
Tucunduba			-		-	-	-	0/20	
<u>BWAMBA GROUP</u>									
Bwamba	R		-		0/636	0/465	0/21	-	
Pongola			-		0/782	0/560	0/20	-	

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Virus name	Natural human disease in adults	Protective vaccine available	overt				Infections of susceptible personnel	
			Number/USPHS SALS	lab II A	infections/III B	experience/IV C		by laboratory class/ D E
Group C	R= reported S= significant		() = inapparent infections					
Apeu	R		0/420	0/52	1/458	0/1	-	R 1
Caraparú	S		2/420	0/27	0/480	0/1	-	
Gumbo Limbo			-	0/152	0/421	-	-	
Itaqui	R		0/420	0/30	0/456	0/1	0/20	
Madrid	R		-	0/40	0/452	0/1	-	
Parituba	R		1/420	0/52	0/500	0/1	-	1
Murutucu	R		1/432	0/86	0/492	-	-	
Hepuyo			0/420	0/28	0/436	-	0/20	
Oriboca	R		0/542	0/72	0/462	0/120	-	R 1
Ossa	R		-	0/2	1/474	-	-	R
Restan	R		-	0/22	0/440	-	-	
CALIFORNIA GROUP								
Bocas			-	0/22	0/542	-	0/2	
California Enc.	R		0/581	0/1117	0/660	0/166	-	
Inkoo	R		-	0/14	0/424	-	-	
Jacrestown Canyon			0/441	0/556	0/582	0/21	-	
Jerry Slough			-	0/34	0/564	0/2	0/540	
Keystone			0/122	0/500	0/562	0/1	-	
La Crosse	S		0/180	0/553	0/1228	0/140	-	
Melao			0/13	0/56	0/466	-	-	
San Angelo			-	0/20	0/562	-	0/20	
Tahyna	R		0/140	0/558	0/824	0/163	-	
Trivittatus			0/261	0/496	0/646	0/123	-	
Snowshoe Hare			0/2	0/20	-	0/20	-	
CAPRII GROUP								
Acara			0/120	0/2	0/440	-	0/2	
Bushbush			0/120	0/20	0/452	-	-	
Capim			0/120	0/32	0/475	-	-	
Guajara			0/120	0/2	0/452	-	-	
Juan Diaz			-	-	0/440	-	-	
Foriche			-	0/2	0/440	-	-	
GUAMA GROUP								
Bertioqa			-	-	0/422	-	-	
Bimitti			-	0/4	0/422	-	-	
Catu	R		1/422	0/20	0/454	-	0/20	
Guama	R		0/420	0/40	0/499	-	-	
Mahogany Hancock			-	0/12	0/473	-	-	
Koju			0/420	0/2	0/422	-	-	

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Virus name	Natural human disease in adults	Protective vaccine available	overt laboratory class					Infections of susceptible personnel
			USPHS SALS	II A	III B C		IV D E	
<u>DOONGOL GROUP</u>								
Koongol			0/2	0/21	0/424	0/2	0/252	
Wongal			0/2	0/132	0/436	-	-	
<u>PATOIS GROUP</u>								
Pahayokee			-	0/120	0/553	-	-	
Patois			-	0/24	0/455	-	-	
Shark River			-	0/122	0/433	-	0/120	
Zegla			-	0/22	0/456	-	-	
<u>Simbu</u>								
Aino			0/20	0/20	0/422	0/2	-	
Akabane			0/262	0/4	0/542	0/2	-	
Buttonwillow			-	0/30	0/434	0/12	0/440	
Ingwayuma			-	0/538	0/454	0/2	-	
Manzanilla			-	0/4	0/454	-	-	
Permet			-	0/22	0/434	-	-	
Nola			-	0/4	0/420	-	-	
Oropouche	S		5/420	0/34	0/474	-	-	R 2
Sabo			-	0/434	0/420	0/2	-	
Sango			-	0/446	0/540	0/2	-	
Sathuperi			-	0/434	0/436	0/2	-	
Shamonda			-	0/432	0/420	0/2	-	
Shuni			-	0/540	0/420	0/2	-	
Simbu			-	0/804	0/435	0/2	0/20	
Thimiri			-	-	0/420	-	-	
<u>TETE GROUP</u>								
Bahig			-	0/4	0/422	0/4	-	
Matruh			-	0/6	0/420	-	-	
Yete			-	0/36	0/420	0/2	-	
Tsuruse			-	0/20	0/420	-	-	
<u>UNASSIGNED - "SBU"</u>								
Potanbi			-	0/4	0/420	-	-	
Gamboia			-	0/12	0/420	-	-	
Guaratuba			-	-	0/420	-	-	
Jurona			-	0/20	0/420	-	-	
Kaeng Khot			-	0/2	0/423	-	-	
Minatitlan			-	0/2	0/420	-	-	
Mirim			0/120	-	0/421	-	0/2	

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Virus name	Natural human disease in adults	Protective vaccine available	overt/ Number/lab infections/experience by					Infections of susceptible personnel
			USPHS SALS	II A	III / B C /		IV / D E /	
<u>Bunyavirus-like</u>								
<u>Phlebotomus fever</u>								
Aguacate			-	0/2	0/440	-	-	
Anhanga			0/12	0/122	0/442	-	-	
Arumowot			-	0/44	0/440	-	-	
Bujaru			0/12	0/122	0/440	-	0/2	
Cacao			-	0/2	0/440	-	-	
Calmito			-	0/2	0/440	-	-	
Candiru	R		0/12	0/4	0/440	-	-	
Chagres	R		-	0/124	0/444	-	0/2	
Chilibre			-	0/22	0/440	-	-	
Frijoles			-	0/2	0/440	-	-	
Gordil			-	0/6	0/446	-	-	
Icoaraci			0/420	0/122	0/440	-	0/2	
Itaporanga			0/20	0/142	0/442	-	-	
Karimabad			-	0/32	0/440	0/2	-	
Nique			-	0/2	0/440	-	-	
Pacui			0/540	0/2	0/440	-	-	
Punta Toro	R		-	0/122	0/446	-	-	
Salchabad			-	0/140	0/440	-	-	
SF-Naples	S		0/2	0/342	0/718	-/24	-	
SF-Sicilian	S		0/2	0/741	0/617	0/64	0/20	
<u>Tick-borne</u>								
<u>CHF-CONGO GROUP</u>								
Congo	S		-	4/674	0/420	0/4	0/2	S
Hazara			-	0/4	0/422	0/4	-	
<u>GANJAM GROUP</u>								
Dugbe	R		-	1/580	0/542	0/2	-	R
Ganjam	R		-	-	0/6	0/4	-	R
<u>KAISODI GROUP</u>								
Kaisodi			-	0/2	0/420	0/4	-	
Lanjan			0/2	0/22	0/442	0/2	-	
Silverwater			0/2	0/26	0/544	0/2	-	
<u>THOGOTO GROUP</u>								
Thogoto	S		0/120	0/216	0/424	0/2	-	
<u>UUKUNIEMI GROUP</u>								
Grand Arbaud			-	0/22	0/422	-	-	
Panawa			-	0/4	0/422	-	-	
PonCeves			-	-	-	-	-	
Uukuniemi			0/120	0/286	0/32	0/140	-	
Zaliv Terpeniya					0/420	-	-	

Virus name	Natural human disease in adults	Protective vaccine available	overt laboratory class					Infections of susceptible personnel
			USPHS SALS	II A	III / B C /		IV / D E /	
<u>Minor groups</u>								
<u>ANOPHELES A GROUP</u>								
Anopheles A			0/12	0/45	0/441	0/2	0/120	
Lukuni			0/12	0/120	0/420	-	-	
Iacaiuma	R		0/420	0/20	0/540	-	-	
<u>ANOPHELES B GROUP</u>								
Anopheles B			-	0/26	0/429	-	-	
Boracea			-	-	0/420	-	-	
<u>BAYAU GROUP</u>								
Bakau			0/2	0/6	0/443	0/2	-	
Ketapang			0/2	0/4	0/440	-	-	
<u>MAPPUTTA GROUP</u>								
Mapputta			0/152	0/2	0/422	-	-	
Maprik			0/2	-	0/420	-	0/12	
Trubanaman			0/134	-	0/422	-	-	
<u>TURLOCK GROUP</u>								
M'Poko (=Yaba-1)			-	0/36	0/424	0/1	-	
Turlock			0/862	0/486	0/455	-	-	
Umbre			-	0/20	0/440	-	-	
<u>Ungrouped mosquito</u>								
Rift Valley fever	S	+	0/2	3/480	0/122	0/120	-	S 29
Tataguine	S		-	0/562	0/420	0/2	-	
Witwatersrand			-	0/36	0/421	-	-	
<u>Ungrouped-tick</u>								
Bhanja			-	0/694 (4)	1/425	0/4	0/20	R
Lone Star			-	0/40	0/437	-	-	
Nairobi sheep disease	R		-	0/36	0/4	0/2	-	R 1

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Virus name	Natural human disease in adults	Protective vaccine available	Number/lab infections/experience by					Infections of susceptible personnel
			USPHS SALS	II A	III / B C /		IV / D E /	
<u>Orbivirus</u>								
<u>Tick-borne</u>								
<u>KEMEROVO</u>								
Baku			-	0/14	0/422	0/2	-	
Bauline			0/2	0/20	0/422	-	-	
Cape Wrath			-	0/20	0/422	-	-	
Chenuda			-	0/168	0/444	-	-	
Great Island			0/1	0/20	0/422	0/2	-	
Huacho			-	0/40	0/440	-	-	
Kemerovo			-	0/144	0/426	0/2	-	R
Lipovnik	R		-	0/20	0/422	0/2	-	
Mono Lake			-	0/40	0/441	-	-	
Okhotskiy			-	0/20	0/422	-	-	
Seletar			-	0/20	0/440	-	-	
Sixgun City			0/2	0/2	0/440	-	-	
Tribec			-	0/20	0/21	-	-	
Wad Madani			-	0/146	0/444	0/140	-	
Yaquina Head			-	0/23	0/444	0/2	-	
Nugget			-	0/20	0/440	-	0/2	
Nugget			0/2	-	0/2	-	-	
<u>Minor groups</u>								
<u>AFRICAN HORSE SICKNESS</u>								
African horsesickness			0/12	0/272	-	0/20	-	
<u>BLUETONGUE GROUP</u>								
Bluetongue			0/240	0/246	0/498	0/20	-	
<u>CHANGUINOLA GROUP</u>								
Changuinola			-	0/2	0/443	-	-	
Irituia			0/12	-	0/442	-	-	
<u>CORRIPARTA GROUP</u>								
Acado			-	0/2	0/420	-	-	
Corriparta			0/2	0/136	0/422	-	-	
<u>EHD GROUP</u>								
Epizootic hem. dis.			0/120	0/454	0/466	0/122	-	
<u>EUBENANGEE GROUP</u>								
Eubenangee			0/20	0/2	0/423	-	0/134	
Pata			-	0/4	0/420	0/2	-	
<u>PALYAM GROUP</u>								
D'Aquilar			0/22	0/122	0/423	-	-	
Kasba			-	-	0/420	-	-	
Palyam			-	0/2	0/423	0/2	-	
Vellore			-	-	0/420	-	-	
<u>WARREGO GROUP</u>								
Mitchell River			-	0/122	0/422	-	-	
Warrego			0/120	0/2	0/422	-	-	

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Virus name	Natural human disease in adults	Protective vaccine available	overt/ laboratory class/ Number /lab infections/experience by					Infections of susceptible personnel
			USPHS SALS	II A	III B C	IV D E		
<u>Ungrouped-mosquito</u>								
Japanaut			0/24	-	0/420	-	-	
Lebombo			-	0/284	0/421	-	-	
Umatilla			-	0/182	0/420	-	-	
<u>Ungrouped-tick</u>								
Colorado tick fever	S		2/262	0/199	1/1142(?)	-	-	S 8
Eyach				0/1	-	0/20	-	
<u>Rhabdovirus</u>								
<u>KWATTA GROUP</u>								
Kwatta			0/120	-	0/423	-	-	
<u>MOSSURIL GROUP</u>								
Kamese			-	0/16	0/420	0/2	-	
Mossuril			-	0/172	0/420	0/2	-	
<u>VESICULAR STOMATITIS GR.</u>								
Chandipura			-	0/26	0/442	0/22	-	
Cocal			0/421	0/2	0/478	0/4	0/4	S
Piry			3/420	0/2	2/456	0/22	-	
VSV-Indiana	R		1/4782	1/516	0/1582	0/22	-	S
VSV-New Jersey	R		1/546	1/80	0/890	(1)0/2	-	S } 38
<u>Ungrouped-mosquito</u>								
Flanders			0/41	0/156	0/582	0/12	0/460	
Hart Park			0/441	0/506	0/560	0/12	-	
Joinjakaka			0/14	-	0/422	-	-	
<u>Ungrouped-tick</u>								
Barur			-	-	0/421	0/2	-	
<u>Ungrouped-no arth.</u>								
Kern Canyon			-	0/24	0/584	-	0/14	
Lagos Sat			-	0/137	0/442	0/22	-	
Mount Elgon Bat			-	0/13	0/422	0/2	-	
Navarro			-	0/20	0/421	-	-	

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Virus name	Natural human disease in adults	Protective vaccine available	overt laboratory class/ Number/lab infections/experience by				Infections of susceptible personnel
			USPHS SALS	II A	III B C	IV D E	
<u>Arenavirus</u>							
Amapari			0/421	0/22	0/546	0/240	0/2
Junin	S	+	-	0/4	0/440	10/540(5)	0/3 R 5
Lassa	S		-	0/120	2/420	0/0	0/20 S
Latino			-	-	0/126	0/240	-
Machupo			-	0/3	0/422	0/120	0/121 R 1
Parana	S		-	-	0/166	0/142	-
Pichinde			0/1	-	0/166	0/142	-
Tacaribe			0/421(7)	0/12(6)	0/110(3)	0/120	-
Tamiami			0/5	0/70	0/1138	0/122	-
* LCM			0/1	0/682	0/684	0/122	0/20
			7/285	2/509(1)	4/1261(1)	2/225	-
<u>Picornavirus-mosquito</u>							
Nodamura			-	0/2	0/422	0/22	-
<u>Poxvirus-mosquito</u>							
Cotia	R		0/12	-	0/442	-	-
<u>Iridovirus-tick</u>							
African swine fever			-	-	-	-	-
<u>Paramyxovirus-no arth.</u>							
Nariva			-	-	0/420	-	-
<u>Unclassified Tick-borne</u>							
<u>DERA GHAZI KHAN GROUP</u>							
Abu Hamad			-	-	0/420	0/2	-
Dera Ghazi Khan			-	0/2	0/422	0/2	-
Kao Shuan			-	-	0/420	-	0/20
Pathum Thani			-	0/2	0/440	-	-
Pretoria			-	-	0/420	-	-
<u>HUGHES GROUP</u>							
Hughes			-	0/146	0/562	0/2	-
Punta Salinas			-	0/40	0/440	0/2	-
Soldado			-	0/20	0/422	0/2	-
Zirqa			-	0/20	0/442	0/2	-

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Virus name	Natural human disease in adults	Protective vaccine available	Number/over/ lab infections/experience by					infections of susceptible personnel
			USPHS SALS	II A	III B	C	IV D	
<u>QALYUB GROUP</u>								
Bandia			-	0/128	0/422	0/2	-	
Qalyub	R		-	0/4	0/422	0/2	-	
<u>QUARANFIL GROUP</u>								
Johnston Atoll			0/140	0/36	0/444	-	-	
Quaranfil	R		-	0/244	0/446	0/2	-	
<u>SAKHALIN GROUP</u>								
Avalon			0/2	0/2	0/422	-	-	
Clo Mor			-	-	0/424	-	-	
Sakhalin			0/2	0/2	0/424	0/2	-	
Taggert			0/2	-	0/2	-	-	
<u>Minor gr</u>								
<u>BOTEKE GROUP</u>								
Boteke			-	0/4	0/420	0/2	-	
Zingilamo			-	0/4	0/420	-	-	
<u>MALAKAL GROUP</u>								
Malakal			-	-	0/422	-	-	
Puchong			-	0/2	0/440	-	-	
<u>MATARIYA GROUP</u>								
Burg el Arab			-	0/2	0/422	-	-	
Garba			-	0/4	0/420	-	-	
Matariya			-	0/2	0/420	-	-	
<u>NYANDO GROUP</u>								
Nyando	R		-	0/16	0/420	0/20	-	
<u>TIMBO GROUP</u>								
Chaco			0/12	-	0/420	-	-	
Timbo			0/12	-	0/420	-	-	

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Virus name	Natural human disease in adults	Protective vaccine available	overt/ laboratory class/ Number/lab infections/experience by					Infections of susceptible personnel	
			USPHS	II	/III/		/IV/		
			SALS	A	B	C	D		E
<u>Ungrouped-mosquito</u>									
Arkonam			-	-	0/420	-	-		
Aruac			-	-	0/420	-	-		
Bangoran			-	0/4	0/420	-	-		
Belmont			-	-	0/420	-	0/20		
Gomoka			-	0/4	0/420	-	-		
Ieri			0/12	-	0/420	-	-		
Kowanyama			0/124	-	0/422	-	-		
La Joya			-	-	0/422	-	-		
Minnal			-	-	0/422	-	-		
Nkolbisson			-	0/34	0/420	-	-		
Okola			-	0/34	0/420	-	-		
Pacora			-	-	0/422	-	-		
Tanga			-	0/14	0/420	0/2	-		
Tembe			-	-	0/420	-	-		
Trinitti			-	0/2	0/420	-	-		
Venkatapuram			-	-	0/420	-	-		
Wongorr			0/120	-	0/422	-	-		
Yata			-	0/4	0/420	-	-		
Zinga	R		-	3/134	0/420	-	-	2	
<u>Ungrouped-varios arthrop</u>									
Batken			-	-	0/420	-	-		
Charleville			0/120	0/2	0/420	-	-		
Chobar Gorge			-	0/2	0/422	-	-		
Dhori			-	0/16	0/420	0/2	-		
Issyk-Kul			-	-	0/420	-	-		
Keterah			-	0/2	0/442	0/2	-		
Matucare			-	0/2	0/424	-	-		
Ngaingan			0/120	-	0/422	-	-		
Nyamanini			-	0/286	0/444	0/2	0/2		
Sawgrass			-	0/6	0/560	0/2	-		
Tettang			-	0/22	0/420	-	-		
Upolu			0/122	0/20	0/424	-	-		
Wallal			0/2	-	0/422	-	0/120		
Wanowrie			-	0/14	0/424	-	-		
Bovine ephemeral fever			-	0/120	0/2	-	-		

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Virus name	Natural human disease in adults	Protective vaccine available	Number of laboratory class/ infectious/experience by					infections of susceptible personnel
			USPHS II SALS A	overt/ lab infections/ III B C		IV D E		
<u>ungrouped no arthropod</u>								
Almpiwar			0/120	-	0/422	-	-	
Bangui	R		-	0/4	0/420	-	-	
Binbo			-	0/4	-	-	-	
Gossas			-	0/12	0/420	-	-	
Karmavanpettai			-	-	0/420	-	-	
Kannamangalam			-	-	0/420	-	-	
Keraliba			-	0/132	0/420	-	-	
Kolongo			-	0/2	0/420	-	-	
Landjia			-	0/2	0/420	-	-	
Le Dantec			-	0/24	0/420	-	-	
Harburg	S		-	0/2	0/2	0/140	-	S
Marco			0/12	0/2	0/420	-	-	
Quango			-	0/4	0/420	-	-	
Saint-Floris			-	0/4	0/420	-	-	
Sandjimba			-	0/4	0/420	-	-	
Sembalam			-	-	0/420	-	-	
Simian Hemorrh. fever			-	0/2	0/420	-	-	
Tanjong Babok			-	0/2	0/440	-	-	
Thottapalayam			-	-	0/422	-	-	
Toure			-	0/24	0/420	-	-	
Yogue			-	0/26	0/420	0/2	-	

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Virus. Overt lab infections/ deaths as of 1967 article	Information from SALS survey 1976				
	Type of facility, location and years	Numbers of overt lab infections/ no. at risk (no. inapparent infections)	Vaccination, type of vaccine, interval between vaccine and illness	Severity, type and duration of illness	Probable source of infection in lab and strain of virus
Bebaru 0/0	B Brisbane, Aust	0/6 (1)	No		Unknown
Chikungunya 19/0	A Colombo, Ceylon 1960-76	1/4 (1)	No		?
	B Johann, SA 1956-75	2/10	No		Aerosol
	B Entebbe, Ug 1970-76	5/18	No		Accident-1, others unknown
	B WRAIR 1946-76	3/10	No		Infection -2, aerosol -1
	B NIH-Tokyo 1950-75	2/2	No		Aerosol
	C YARU 1964-75	1/45	No		?
EE 2/0	D USAMRIID 1971-76	0/60 (2)	Yes	anby rises	Aerosol
Mayaro 3/0	A Belem-ECI ?-1976	1/30	No		? aerosol
	C YARU 1964-75	0/45 (1)	No	CF anby rise	unknown
Semliki Forest	B Milwaukee, Wisc 1970-75	0/7 (1)	No		unknown
Onyong-nyong 0/0	B Entebbe, Ug 1970-76	1/18	No		accident
Ross River	B Brisbane, Aust 1957-76	0/20 (5)	No		unknown (? some natural)
WEE 5/2	D USAMRIID 1971-76	0/60 (2)	Yes		Aerosol

Virus. Overt lab infections/ deaths as of 1967 article	Information from SALS survey 1976				
	Type of facility, location and years	Numbers of overt lab infections/ no. at risk (no. inapparent infections)	Vaccination, type of vaccine, interval between vaccine and illness	Severity, type and duration of illness	Probable source of infection in lab and strain of virus
VEE 118/1	A Mexico-Invest. Pecuarías 1970-76	1/1	No		Accident, aerosol
(24=1 episode, Prob Virol 4:54, 1959)	B Cornell 1963,64,72	3/15	No - 2 (1 vacc failure) Yes - 1, TC83, 1 ² /3 yr	Mild, systemic, 3 days Moderate, systemic, 5 days	Accident, aerosol, Mexico 1963, Guat 1970-71 Infected hamster blood on fingers Mexican 1963 strain
	B CDC-Montgomery 1949-60	3/18	No		Aerosols - gp, blood (2). mouse brain (1)
	B Guayaquil, Ecuador ? years	3/?	No		Aerosol
	B Cali, Colombia 1956-72	5/15	No		Aerosol
	B Maracaibo, Ven 1967-76	1/18	No		Aerosol
	B Moscow, Ivanovsky 1957-75	3/6	No		Accident
	B NIH-Tokyo 1950-75	5/8	No		Aerosol
	C U. Wisc-Madison ? years	1/3	No - 1 (=case) Yes - 2		Aerosol, Colombian field isolate
	C Panama-Gorgas MARU 1961,64,67	3/?	Yes - 1 TC80, 2 TC83 1/3, 1 & 1 ¹ / ₂ yrs	Moderate, systemic	?
	C YARU 1967	1/45	No	Moderate, systemic *	Accidental infection Trinidad donkey
C Austin, Texas ? years	1/?			Accident	
D USAMRIID 1971-76		0/120(2)		Aerosol	
Mucambo 2/0	B Mexico-Virus Inst AJTMI 14:475, 1965				

Virus. Overt lab infections/ deaths as of 1967 article	Information from SALS survey 1976				
	Type of facility, location and years	Numbers of overt lab infections/ no. at risk (no. inapparent infections)	Vaccination, type of vaccine, interval between vaccine and illness	Severity, type and duration of illness	Probable source of infection in lab and strain of virus
Dengue 6/0	B Hawaii-PRS ? years	3/20	No		? Mosq. DEN 2
	B WRAIR 1946-76	1/13	No		Injection, DEN3
	C YARU 1964-75	1/45	No		? DEN 2
	D USAMRIID 1971-76	0/10 (1)	No		Aerosol, DEN 4
JE 1/0	B U. Minnesota 1957-60	1/5 (1)	No	Mild encephalitis	Hand contact
	B Regina Sask, Can 1965-76	0/? (1)	No		?
	B NIH-Tokyo 1950-75	0/20 (16)	?		?
	D USAMRIID 1971-76	0/15 (2)	No		Needlestick-1 unknown-1
Kunjin 2/0	B Brisbane, Aust 1957-76	2/12 (2)	No		Prob, aerosol
Murray Valley enceph 0/0	B Brisbane, Aust 1957-76	0/20 (3)	No		Unknown
St. Louis enceph 1/0	A U Cal, Berkeley 1963-75	0/64 (?1)	No		Unknown
	C CDC, Montg 1949-60	1/18	No		Needle stick
Spondweni 2/0	B Johann, SA 1956-75	2/10	No		Unknown
Wesselsbron 4/0	B Dakar, Senegal-IP 1963-75	2/10	No		Aerosol
	B Bangui, CA-IP 1965-75	1/5	No		Aerosol
	B Ibadan, Nig 1964-76	1/30	No		? Aerosol
	C YARU 1964-75	2/45	No		Unknown
West Nile 11/0	B Johann, SA 1956-75	1/10	No		Accident cut finger
	B Ivory Coast - IP 1971-76	1/15	No		Accident injection
	B Milwaukee, Wisc 1970-75	0/8 (1)	No		Unknown

Virus. Overt lab infections, deaths as of 1967 article	Information from SALS survey 1976				
	Type of facility, location and years	Numbers of overt lab infections/ no. at risk (no. apparent infections)	Vaccination, type of vaccine interval between vaccine and illness	Severity, type and duration of illness	Probable source of infection in lab and strain of virus
TBE Hypr 18/2	B Prague, Czech 1962-75	3/12 (6)	No		Unknown
	D Bratislava, Czech ? years	4/18 (4)	?		Aerosol-1, others unknown
KFD 65/0	B WRAIR 1946-76	3/10 (1)	?		Aerosol
LI 21/0	B Montana -RML ? years	1/1	?		?
Omsk HF 3/0	C CDC Montg 1949-60	1/2	No		Needle stick
	C YARU 1964-75	1/45	No		Unknown
Pow 1/0	A U. Cal, Berkeley	0/64 (?1)	No		Unknown
RSSE	C Holland, Leiden	1/4	?		? Aerosol (animals)
	D CDC, Ft. Collins ? years	1/1	?		Aerosol
Koutango	B Dakar, Sen-IP 1963-75	1/10	No		Aerosol
Modoc	A U. Cal. Berkeley 1963-75	0/64 (1)	No		Unknown
Rio Bravo 5/0	A U. Cal. Berkeley 1963-75	0/64 (?2)	No		Unknown

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Virus. Overt lab infections/ deaths as of 1967 article	Information from SALS survey 1976				
	Type of facility, location and years	Numbers of overt lab infections/ no. at risk (no. apparent infections)	Vaccination, type of vaccine, interval between vaccine and illness	Severity, type and duration of illness	Probable source of infection in lab and strain of virus
Germiston 3/0	B Johann, SA 1956-75	2/10	No		Unknown
	C YARU 1964-75	1/45	No		Unknown
Apeu 1/0	C NIH-CNS Lab 1960/75	1/3	No		Pipette accident
Caraparu	A Belem-ECI ?-1976	2/30	No		? aerosol
Marituba 1/0	A Belem-ECI ?-1976	1/30	No		? aerosol
Murutucu	A Belem-ECI ?-1976	1/30	No		? aerosol
Ossa	C CDC, Atlanta 1969	1/5	No		Hamster bite
Catu	A Belem-ECI ?-1976	1/30	No		? aerosol
Oropouche	A Belem-ECI ?-1976	5/40	No		? aerosol

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Virus. Overt lab infections, deaths as of 1967 article	Information from SALS survey 1976				
	Type of facility, location and years	Numbers of overt lab infections/ no. at risk (no. apparent infections)	Vaccination, type of vaccine interval between vaccine and illness	Severity, type and duration of illness	Probable source of infection in lab and strain of virus
Congo	B Dakar, Sen-IP 1963-75	1/12	No		Tissue culture
	B Entebbe, Ug 1970-76	3/18	No		Unknown
Dugbe	B Ibadan, Nig 1964-76	1/30	No		Aerosol
Rift Valley 29/1	B Johann, SA 1956-75	3/10	?		Unknown
Bhanja	B Rome, Italy 1964-75	0/? (4)	No		Aerosol
	C CDC, Ft. Collins ? year	1/3	No		Aerosol, animal.
Col tick 8/0	A Montana - RML	2/6	No		?
	C CDC, Ft. Collins ? years	0/60 (?5)	No		? field or lab
	C YARU 1964-75	1/45	No		Unknown

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Virus. Overt lab infections/ deaths as of 1967 article	Information from SALS survey 1976				
	Type of facility, location and years	Numbers of overt lab infections/ no. at risk (no. apparent infections)	Vaccination, type of vaccine interval between vaccine and illness	Severity, type and duration of illness	Probable source of infection in lab and strain of virus
Piry 4/0	A Belem - ECI ?-1976	3/30	No		Aerosol
	C YARU 1964-75	2/45	No		Unknown
VSV-Ind } 38/0	A Boston, Mass (AH) 1969-76	1/20	No		Pipette accident
	B WRAIR 1946-76	1/7	No		Aerosol
VSV-NJ }	A MIT, Mass 1968-76	1/100	No		Pipette accident
	B Moscow, Ivanovsky 1957-75	1/?	No		Aerosol
	C YARU 1964-75	0/45 (1)	No		Unknown

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Information from SALS survey 1976

Virus. Overt lab infections/ deaths as of 1967 article	Type of facility, location and years	Numbers of overt lab infections/ no. at risk (no. apparent infections)	Vaccination, type of vaccine interval between vaccine and illness	Severity, type and duration of illness	Probable source of infection in lab and strain of virus
Junin 5/1	?D Med, BA, Arg 1958-76	10/37 (5)	No		Aerosol or injection
Lassa	C YARU 1964-75	2/45	No	One fatal	Unknown
Pichinde	A McMaster, Can	0/24 (7)	No		Unknown
	B Baylor, Tex 1958-76	0/13 (6)	No		Unknown
	C-D USAMRIID 1971-76	0/3 (2)	No		Aerosol
	C YARU 1964-75	0/45 (1)	No		Unknown
LCM	A NIH-LVD (WR) 1952-76	7/10	No		Handled virus or transplants
	B WRAIR 1946-76	1/10	No		Mouse urine in eye
	B Cologne, WG 1960-76	1/6	No		?
	B Canberra, Aus 1961-76	0/12 (1)	No		Lab animals
	C YARU 1964-75	1/45	No		Unknown
	C Troy, NY ? years	1/100 (1)	No		Lab animals
	C-D CDC-Montg 1949-60	2/12	No No		Aerosol- hamster

SALS

Recommendation report

November 1977

Recommendation Report

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- 2) Availability of arbovirus vaccines for laboratories in the United States, 1977.
- 3) A summary and detailed descriptions of recommended levels of competence and containment.
- 4) The specific or provisional hazard group recommendation for each virus. *
- 5) General recommendations concerning work with specimens for isolation of these viruses, development of vaccine candidates and investigations of recombinants.
- 6) The bases for some recommendations.

* It should be emphasized that these recommendations are subject to change. Modifications will certainly be indicated as knowledge expands and wisdom develops.

Subcommittee on Arbovirus Laboratory Safety

Criteria of recommendations for arthropod-borne and certain other viruses of vertebrates by hazard group and containment level

Hazard Group	Natural human disease in adults	Overt laboratory infections (immune status)	For viruses exotic to domestic animals	Containment Level
1	None plus high infection prevalence in natural human populations	None plus extensive historical laboratory experience with virus		1
2	None or mild and self-limited. Infection prevalence in natural human populations unknown	None, or nonaerosol and uncommon plus extensive historical laboratory experience with virus		2
3A	Potentially severe or no information	By aerosol but uncommon, or laboratory experience with virus inadequate to assess risk	Virus isolated (but no disease) from domestic animals in other countries, but not USA	3A
3B	Potentially severe	By aerosol and common if protective vaccine not used or unavailable	Disease in domestic animals in other countries, but not USA	3B
4	Usually severe	Occur (personnel immune)		4A
		Occur (personnel susceptible)		4B **
5			Restricted by U.S. Dept. of Agriculture *	4A or 4B

* Arboviruses excluded from USA by USDA administrative policy (African horse sickness, African swine fever, bovine ephemeral fever, louping ill, Nairobi sheep disease, Rift Valley fever, Wesselsbron disease).

** Containment level depends upon severity of human disease and availability of immune personnel.

Arbovirus Group	Virus	Vaccine Type	Available	FDA Status
A	CHIK ^a	Inactivated	USAMRIID	IND ^b
	EEE	Inactivated	USAMRIID and CDC	IND
	VEE	Attenuated	USAMRIID and CDC	IND
	VEE	Inactivated	USAMRIID	IND
	WEE	Inactivated	USAMRIID	IND
B	YF	Attenuated	USPHS	Licensed vaccine
Ungrouped mosquito borne	RVF	Inactivated	USAMRIID	IND

a. See catalog of arboviruses for abbreviation of viruses.

b. Investigational new drug permit.

Summary of Recommended Competence and Containment Levels for
Arboviruses and Certain Other Viruses of Vertebrates

Containment Level	Special Microbiological Practices	Containment Equipment	Special Laboratory Installations
1	None required	None. Open bench.	None required
2	Care required to limit aerosols and contamination. Limited access.	Class I or II BSC* required for aerosol producing procedures	Designed to facilitate cleaning and disinfection.
3A	All virus materials contained. Special lab gowns required	Class I or II BSC required for all manipulations of infectious materials.	Restricted access, air lock facility, negative air flow. Exhaust air discharged away from building.
3B	Same as 3A plus. Complete clothing change required.	Same as 3A	Same as 3A plus HEPA filtration of exhaust air required.
4A	Rigorous containment of all virus manipulations. Change of clothing and shower required.	Class I or II BSC required for all work with infectious materials.	Facility equivalent to separate building of monolithic design. Includes shower facilities, heat treated biowaste, HEPA filtration of all exhaust, double door autoclaves.
4B	Same as 4A except absolute containment of all virus manipulations.	Class III BSC required for all work with infectious materials.	Same as 4A plus provision for possible operations in one piece, positive pressure suits.

* BSC = Biologic Safety Cabinets

LEVELS OF COMPETENCE AND CONTAINMENT RECOMMENDED FOR EACH ARBOVIRUS HAZARD GROUP

Prepared by the Subcommittee on Arbovirus Laboratory Safety of the
American Committee on Arthropod-Borne Viruses

The descriptions outlined below are the recommended levels of competence and physical containment for work involving the manipulation of the arboviruses appropriate to each Hazard Group. In general arboviruses in Hazard Groups 1, 2, 3A, 3B and 4 are manipulated respectively in facilities meeting Containment Levels 1, 2, 3A, 3B, 4A on 4B with some modifications if the laboratory staff members are specifically vaccinated. Viruses in Hazard Group 5 are individually evaluated with respect to the appropriate Containment Level recommended. Recommendations are based on several factors which may include availability of specific vaccines, virulence, the capacity of the virus to produce aerosol infections, if known, virulence for domestic animals and existing USDA regulations. The descriptions of the containment levels have been adapted from the USPHS publication "Classification of Etiologic Agents on the Basis of Hazard," and from anticipated revisions of the Physical Containment Requirements of the Recombinant DNA Research Guidelines.

CONTAINMENT LEVEL 1 (MINIMAL)

The level of competency of the members of the laboratory staff equals or exceeds that of a typical university department of microbiology.

The laboratory is suitable for experiments involving arboviruses classified in Hazard Group 1, it possesses no special engineering design and may be commonly used for a variety microorganisms meeting the criteria for Hazard Group 1. Work in the laboratory is generally conducted on open bench tops. Special containment equipment is neither required nor generally available.

The following standard and special practices and other criteria apply to experiments with arboviruses in the category of Hazard Group 1:

A. Standard Microbiological Practices

1. Laboratory doors are kept closed while experiments are in progress.
2. Work surfaces are decontaminated daily and immediately following spills of infectious virus.
3. All contaminated materials are decontaminated before disposal or other handling.
4. Mechanical pipetting devices are used for pipetting fluids containing infectious virus.
5. Eating, drinking, smoking, and storage of food are not permitted in the working area.
6. Persons wash their hands after handling virus or infected animals and when they leave the laboratory.
7. Care is taken in the conduct of all procedures to minimize the creation of aerosols.

B. Special Practices

1. Contaminated materials that are to be decontaminated at a site away from the laboratory are placed in a durable leak-proof container which is closed before removal from the laboratory.
2. If experiments with arboviruses are conducted in the same laboratory where experiments requiring a higher level of physical containment are performed, the virus experiments are conducted in accordance with procedures established for the experiment with the greatest biohazard potential.

- C. Containment Equipment - Special containment equipment is not required at Containment Level 1.

D. Laboratory Installations

1. The internal environment of the laboratory is easily cleanable to facilitate housekeeping.
2. Bench tops are impervious and resistant to acid, alkali, organic solvents, and moderate heat.
3. Laboratory furniture is of sturdy construction and readily cleanable.
4. A hand washing facility is available.
5. If the laboratory has openable windows, they are fitted with fly-screens.
6. An autoclave for sterilization of wastes and contaminated materials is available in the same building in which the laboratory is located.

CONTAINMENT LEVEL 2 (LOW)

The level of competency of the laboratory staff equals or exceeds that of a typical university department of microbiology. Staff members have specific training in handling pathogenic arboviruses, and they are supervised by competent scientists.

A laboratory suitable for experiments involving arboviruses classified in Hazard Group 2 is generally similar in construction and design to a Containment Level 1 facility. The Containment Level 2 laboratory incorporates additional criteria (indicated by *) for standard and special microbiological practices, containment equipment and other requirements as outlined below:

A. Standard Microbiological Practices

1. Laboratory doors are kept closed while experiments are in progress.
2. Work surfaces are decontaminated daily and immediately following spills of infectious virus.
3. All contaminated materials are decontaminated before disposal or other handling.

- 4.* Mechanical pipetting devices are used; pipetting by mouth is prohibited.
- 5. Eating, drinking, smoking, and storage of food are not permitted in the working area.
- 6. All persons wash their hands after handling virus or infected animals and when they leave the laboratory.
- 7. Care is taken in the conduct of all procedures to minimize the creation of aerosols.

B. Special Practices

- 1. Contaminated materials that are to be decontaminated at a site away from the laboratory are placed in a durable leak-proof container which is closed before removal from the laboratory.
- 2.* Only persons who have been advised of the potential biohazard may enter the laboratory.
- 3.* Children under 12 years of age do not enter the laboratory.
- 4.* The universal biohazard sign is posted on all laboratory access doors when arboviruses or infected animals are present in the laboratory.
- 5.* Experiments involving infected arthropod vectors are not permitted.
- 6.* An insect and rodent control program is in effect.
- 7.* The use of laboratory gowns, coats, or uniforms is required. Laboratory clothing used within the laboratory is not worn to a lunch room or outside of the building in which the laboratory is located.
- 8.* Animals not related to the experiment are not permitted in the laboratory.

- 9.* Use of the hypodermic needle and syringe is avoided when alternate methods are available.
10. If experiments with arboviruses are conducted in the same laboratory where experiments requiring a higher level of physical containment are performed, the virus experiments are conducted in accordance with procedures established for the experiment with the greatest biohazard potential.

C. Containment Equipment

- 1.* Biological Safety Cabinets are used to contain aerosol-producing equipment such as blenders, lyophilizers, sonicators, centrifuges and open vessel devices used for growth or propagation of microorganisms by aeration or shaking when this equipment is used to process virus. Biological Safety Cabinets are not required where aerosol-producing equipment is contained by other physical containment equipment. For example, a centrifuge may be operated in the open if a sealed head or safety centrifuge cups are used.

D. Laboratory Installations

1. The internal environment of the laboratory is easily cleanable to facilitate housekeeping.
2. Bench tops are impervious and resistant to acid, alkali, organic solvents, and moderate heat.
3. Laboratory furniture is of sturdy construction and readily cleanable.
4. A hand washing facility is available.
5. If the laboratory has openable windows, they are fitted with fly-screens.
6. An autoclave for sterilization of wastes and contaminated materials is available in the same building in which the laboratory is located.

CONTAINMENT LEVEL 3 (Moderate)

The level of competency of the laboratory staff equals or exceeds that of a typical university department of microbiology. Staff members have specific training in handling potentially lethal arboviruses, and they are supervised by competent scientists who are experienced in work with these viruses.

A laboratory suitable for experiments involving arboviruses classified in Hazard Group 3 has special engineering and design features and physical containment equipment. The Containment Level 3 laboratory conforms to special criteria for standard and special microbiological practices, containment equipment and other requirements. An additional classification within this category distinguishes between laboratories conforming to Containment Level 3A and those conforming to Containment Level 3B. As outlined below, the latter category additionally requires HEPA filtration of exhaust air and a complete change of clothing prior entrance and exit from the laboratory. All Containment Level 3 laboratories are considered to be Containment Level 3A unless they meet the more stringent Containment Level 3B criteria described in items B.8. and D.9. below. Criteria different from Containment Level 2 are designated by an asterisk.

A. Standard Microbiological Practices

1. Laboratory doors are kept closed while experiments are in progress.
2. Work surfaces are decontaminated daily and immediately following spills of infectious virus.
3. All contaminated materials are decontaminated before disposal or other handling.
4. Mechanical pipetting devices are used; pipetting by mouth is prohibited.
5. Eating, drinking, smoking, and storage of food are not permitted in the working area.

6. Persons wash their hands after handling virus or infected animals and when they leave the laboratory.
7. Care is taken in the conduct of all procedures to minimize the creation of aerosols.

B. Special Practices

1. Contaminated solid materials that are to be decontaminated at a site away from the laboratory area are sealed in a durable leak-proof container before removal from the laboratory area. Contaminated liquids are autoclaved in the laboratory area.
- 2.* Only persons whose entry into the laboratory is required on the basis of program or support needs are authorized to enter. Such persons shall be advised of the potential biohazards before entry and shall comply with all required entry and exit procedures. Protocols for emergency situations are established and practiced.
3. Children under 12 years of age do not enter the laboratory.
- 4.* The universal biohazard sign is posted on all laboratory area access doors when arboviruses or infected animals are present in the laboratory.
- 5.* No work in open vessels or involving hosts or vectors infected with arboviruses is conducted on the open bench. Experiments with the live arthropods are conducted in laboratories specially designed to prevent escape of arthropods. A surveillance system is in effect to detect and destroy escaped arthropods and free-living arthropods that have entered the laboratory area.
- 6.* The work surfaces of biological safety cabinets and surfaces of other containment equipment are decontaminated following the completion of the experimental activity contained within them.
7. An insect and rodent control program is in effect.

- 8.* Laboratory clothing that protects street clothing (i.e., long sleeve solid-front or wrap-around gowns, no-button or slipover jackets, etc.) is worn in the laboratory. FRONT-BUTTON LABORATORY COATS ARE UNSUITABLE. Provision of laboratory shoes or waterproof overboots is recommended. Laboratory clothing is not to be worn outside the laboratory and is decontaminated before it is sent to the laundry. Containment Level 3B laboratories provide a complete change of clothing at the entry to the laboratory area. The laboratory clothing remains within the laboratory area and is decontaminated before it is sent to the laundry.
- 9.* Raincoats, overcoats, topcoats, coats, hats, caps, and such street outerwear are not kept in the laboratory.
- 10.* Gloves are worn when handling arboviruses or infected animals. They are removed aseptically immediately following the handling procedure.
- 11.* Surgical or respirator masks are worn in rooms where infected animals are present.
- 12.* Animals and plants not related to the experiment are not permitted in the laboratory.
- 13.* Vacuum lines are protected by filter and liquid disinfectant traps.
14. Use of the hypodermic needle and syringe are avoided when alternate methods are available.
15. If experiments with arboviruses are conducted in the same laboratory where experiments requiring a higher level of physical containment are performed, the virus experiments are conducted in accordance with procedures established for the experiment with the greatest biohazard potential.

C. Containment Equipment

- 1.* Biological Safety Cabinets or other physical containment equipment are used to contain all procedures that produce aerosols (e.g., pipetting, dilutions, transfer operations, inoculation, plating, flaming, grinding, blending, drying, sonicating, shaking, centrifuging, etc.) where these procedures involve infectious virus.
- 2.* Experiments requiring Containment Level 3 physical containment can be conducted in Containment Level 2 laboratories provided that (a) all standard and special practices specified for the Containment Level 3 are followed; (b) all operations and procedures are contained in Class III Biological Safety Cabinets, and (c) materials are only removed from these cabinets through an attached autoclave or in a nonbreakable sealed container which is passed through an attached disinfectant dunk tank or fumigation chamber.
- 3.* Laboratory animals which may be shedding arboviruses are housed in the area in partial containment caging systems such as open cages placed in ventilated enclosures, solid wall and bottom cages covered by filter bonnets, or solid wall and bottom cages placed on holding racks equipped with ultraviolet radiation lamps and reflectors.
- 4.* Live arthropods are held in secure screened cages within an insectary room which is also screened or otherwise made secure against escape of arthropods. Walls of the insectary are painted white to allow detection and destruction of escaped arthropods.

D. Laboratory Installations

- 1.* The laboratory is separated from areas which are open to unrestricted traffic flow within the building. Separation is provided by either a double door access vestibule, a double door change room, an air lock

or other access facility which requires passage through two sets of doors to gain access to the laboratory. Access to the laboratory area is designed to prevent entrance of free-living arthropods.

- 2.* The surfaces of walls, floors, and ceilings are impervious and readily cleanable. Penetrations through these surfaces are sealed or capable of being sealed to facilitate space decontamination.
- 3. Bench tops are impervious and resistant to acid, alkali, organic solvents, and moderate heat.
- 4.* Laboratory furniture is ^{of} simple sturdy construction, readily cleanable and installed with a minimum of void or inaccessible spaces.
- 5.* A hand washing facility is provided near each laboratory exit area.
- 6.* Windows in the laboratory are sealed.
- 7.* Laboratory doors are self-closing.
- 8.* An autoclave for sterilization of wastes and contaminated materials is available in the laboratory area.
- 9.* An exhaust air ventilation system is provided. This system creates directional air flow whereby air is drawn into the laboratory environment through the entry area. Directional air flow may be achieved by a building exhaust air system provided that the exhaust air is not recirculated to any other areas of the building. Recirculation of air within the laboratory room, however, may be provided. The exhaust air from the laboratory is discharged to the outside so that it is dispersed clear of occupied buildings and air intakes. The exhaust air from the laboratory which is not derived from the biological safety cabinets can be discharged to the outside without being treated. Containment Level 3B laboratories provide for HEPA filtration of all exhaust air prior to discharge to the outside.

- 10.* In laboratories which have supply air systems, the supply air and exhaust air systems are interlocked to assure inward (or zero) air flow at all times.
- 11.* The treated exhaust air from Class I and Class II Biological Safety Cabinets can be discharged directly to the laboratory room environment or to the outside. The treated exhaust air from a Class III cabinet is discharged to the outside. If the treated exhaust air from these cabinets is to be discharged to the outside through a building exhaust air system it is connected to this system so as to avoid any interference with the air balance of the cabinet or building exhaust air system.

CONTAINMENT LEVEL 4 (High)

The level of competency of the laboratory staff generally exceeds that of typical university department of microbiology with respect to handling dangerous pathogens. The staff members have specific and thorough training in handling arboviruses known to produce severe or fatal disease in man, and they understand the primary and secondary containment function of the standard and special practices, the containment equipment and laboratory design characteristics. They are supervised by competent scientists who are experienced in work with these viruses.

A laboratory suitable for experiments involving arboviruses classified in Hazard Group 4 is a facility with designated work areas designed to contain arboviruses that are extremely hazardous to man or may cause serious epidemic disease. The facility is either a separate building or a clearly demarcated and isolated zone within a building. A specific facility operations manual or standard operating procedure is available.

Levels 4A and 4B are subclassifications within this Containment Level. These distinguish between the operation of the facility using (1) Class I or Class II Biological Safety Cabinets (Level 4A) and (2) Class III Biological Safety Cabinets and/or one-piece positive pressure suits (4B). In the Containment Level 4 requirements outlined below the standard and special practices, containment equipment and laboratory installations additionally required for a Level 4B facility are underscored. Criteria different from Containment Level 3 are indicated by an asterisk.

A. Standard Microbiological Practices

1. Laboratory doors within the facility are kept closed while experiments are in progress.
2. Work surfaces are decontaminated daily and immediately following spills of infectious virus.
3. All contaminated materials are decontaminated before disposal or other handling.
4. Mechanical pipetting devices are used; pipetting by mouth is prohibited.
5. Eating, drinking, smoking, and storage of food are not permitted in the working area.
6. Persons wash their hands after handling virus or infected animals and when they leave the laboratory.
7. Care is taken in the conduct of all procedures to minimize the creation of aerosols.

B. Special Practices

- 1.* No materials, including those materials removed from Class III cabinets are removed from the facility unless they have been sterilized or decontaminated as they pass out of the facility.

All wastes and other materials and equipment not damaged by high temperature or steam are sterilized in the double-door autoclave of the facility. Biological materials to be removed from the facility are transferred to a nonbreakable sealed container which is then removed from the facility through a pass-through disinfectant dunk tank or a fumigation chamber. Other materials which may be damaged by temperature or steam are sterilized by gaseous or vapor methods in an air lock or chamber designed for this purpose.

- 2.* Most materials within Biological Class I and II Safety Cabinets are removed from the cabinet only after disinfection, sterilization or appropriate decontamination. However, biological materials for storage are sealed in a nonbreakable container which may be removed following external chemical disinfection. Other biological materials (e.g., inoculated cell cultures, inoculated animals) should be suitably covered prior to movement to incubators or animal holding rooms within the facility. Materials within the Class III Biological Safety Cabinets are removed from the cabinet system through an attached double-door autoclave or in a nonbreakable sealed container which is passed through a disinfectant dunk tank or a fumigation chamber unless the whole cabinet system has been disinfected by terminal fumigation before the container is removed.
- 3.* Only persons whose entry into the facility or individual laboratory rooms is required on the basis of program or support needs are authorized to enter. Access to the facility is limited by means of secure, locked doors; keys are kept under the supervision of a Safety Officer or other individual responsible for the security of the facility.

Persons are advised of the potential biohazards and instructed as to the appropriate safeguards to ensure their safety before entry. Such persons comply with the instructions and all other posted entry and exit procedures. Protocols for emergency situations are established and practiced.

- 4.* Children under 15 years of age shall not enter the facility.
- 5.* Personnel enter into and exit from the facility only through the clothing change and shower rooms. Personnel shower at each exit from the facility. The air locks are not used for personnel entry or exit except for emergencies.
- 6.* Street clothing is removed in the outer change room of the facility and kept there. Complete laboratory clothing including undergarments, pants and shirts or jumpsuits, shoes, head cover, and gloves is provided and used by all persons who proceed farther into the facility. Upon exit, from the inner change room this clothing is stored in lockers or discarded into collection hampers before personnel enter into the shower area.
- 7.* The universal biohazard sign is posted on all facility access doors and all interior doors to individual laboratory rooms where experiments are conducted or infected animals are held.
- 8.* Supplies and materials to be taken into the facility are placed in an entry air lock. After the outer door (opening to the corridor outside of facility) has been secured, personnel occupying the facility retrieve the supplies and materials by opening the interior air lock door. This door is secured after supplies and materials are brought into the facility.
9. An insect and rodent control program is in effect.
- 10.* Animals and plants not related to the experiment are not permitted

in the facility.

11. Use of the hypodermic needle and syringe is avoided when alternate methods are available.
- 12.* If experiments of lesser biohazard potential are conducted in the facility concurrently with experiments requiring Containment Level 4B, they may be confined in Class I or Class II Biological Safety Cabinets or isolated by other physical containment equipment.

C. Containment Equipment

- 1.* Experimental procedures within the facility requiring Containment Level 4A may be conducted in Class I or Class II Biological Safety Cabinets. Experimental procedures involving microorganisms which require Level 4B physical containment are conducted either in (a) a Class III cabinet system or in (b) Class I or Class II cabinets that are located in a specially designed area in which all personnel are required to wear one-piece positive pressure isolation suits.
- 2.* Laboratory animals held in the facility under Level 4A Containment are housed in partial containment caging systems (such as open cages placed in ventilated enclosures, solid wall and bottom cages covered by filter bonnets, and solid wall and bottom cages placed on holding racks equipped with ultraviolet irradiation lamps and reflectors) that are located in a specially designated animal holding areas in which all personnel are required to wear surgical or respirator masks. Animals held under Level 4B containment are housed either in cages contained within the Class III cabinets or in partial containment caging systems identical to those described above but located in a specially designed area in which all personnel are required to wear one piece positive pressure suits.

D. Laboratory Installations

- 1.* The laboratory is located in a facility which is either a separate building or a clearly demarcated and isolated zone within a building. An outer and inner change room separated by a shower room are provided for personnel entry and egress. A double door, ventilated vestibule or air lock is provided for passage of those materials, supplies and equipment which are not brought into the facility through the change room area.
- 2.* Walls, floors and ceilings of the facility are constructed to form a sealed internal shell, which readily allows fumigation and is animal and insect-proof. The internal surfaces of this shell are impervious and chemically resistant to facilitate working and space decontamination. All penetrations through these structures and surfaces are sealed.
- 3.* Internal facility appurtenances, such as light fixtures, air ducts and utility pipes are arranged so as to reduce the horizontal surface area on which dust can settle.
- 4.* Bench tops provide a monolithic surface which is impervious and resistant to acid, alkali, organic solvents and moderate heat.
5. Laboratory furniture is of simple sturdy construction, readily cleanable and installed with a minimum of void or inaccessible spaces.
- 6.* A foot or elbow-operated hand washing facility is provided near the door within each laboratory of the facility.
- 7.* Where a central vacuum system is provided, it does not serve areas outside of the facility. The vacuum system includes in-line HEPA filters as near as practicable to each use point or service cock.

The filters are installed so as to permit in-place decontamination and replacement. Other liquid and gaseous services provided to the facility are protected by devices that prevent back flow.

- 8.* Foot-operated water fountains located in the facility corridors are permitted. The water service provided to the fountain is not connected to the back flow protected distribution system supplying water to the laboratory areas.
9. Laboratory doors self-closing.
- 10.* If windows are provided, they are resistant to breakage, not openable and sealed.
- 11.* A double door autoclave is provided for sterilization of material passing out of the facility. The autoclave door which opens to the area external to the facility is automatically controlled so that it can only be opened after completion of the sterilization cycle.
- 12.* A pass-through dunk tank, fumigation chamber or an equivalent decontamination method shall be provided for safe removal from the facility of material and equipment that cannot be heat sterilized.
- 13.* All liquid effluent drain lines of the facility, including those from sinks, hand washing facilities, showers, toilets, cabinets, floors and autoclaves are connected to a heat sterilization facility. All liquid traps in the lines have extended depth to prevent transient backflow. The liquid effluent from the shower facility may be separately collected and inactivated by chemical treatment. HEPA filters are installed in all drain vent lines.

- 14.* An individual supply and exhaust air ventilation system is provided. The system maintains pressure differentials and directional air flow as required to assure inflow from areas outside of the facility toward areas of highest potential risk within the facility. Manometers are provided to sense pressure differentials between all areas that are maintained at different pressure levels. The manometers sound an alarm in event of system malfunction. The supply and exhaust air flow is interlocked to assure inward (or zero) air flow at all times.
- 15.* Recirculation of air within individual laboratories of the facility is permissible provided this air is filtered by a HEPA filter.
- 16.* The exhaust air from the facility is filtered by HEPA filters and discharged to the outside so that it is dispersed clear of occupied buildings and air intakes. The filters are located as near to the laboratories within the facility as practicable in order to reduce the length of potentially contaminated air ducts. The filter chambers are designed to allow in situ decontamination before removal and to facilitate certification testing after replacement. Coarse filters are provided for treatment of air supplied to the facility in order to increase the lifetime of the HEPA filters.
- 17.* The treated exhaust air from Class I and Class II Biological Safety Cabinets can be discharged directly to the laboratory room environment or to the outside via the facility air exhaust system. The treated exhaust air from Class III cabinets is discharged to the outside. If the treated exhaust air from any of these cabinets is to be discharged to the outside through the facility exhaust air system, it is connected to this system so as to avoid any interference with the air balance of the cabinets or the facility exhaust air

system.

- 18.* A specially designed suit area may be provided in the facility. Personnel who enter this area shall wear a one-piece positive pressure suit that is ventilated by a life support system. The life support system shall be provided with alarms and emergency backup tank air. Entry to this area is through an air lock fitted with air tight doors. A chemical shower area is provided to decontaminate the surfaces of the suit before removal. The exhaust air from the suit area is filtered by two sets of HEPA filters installed in series. A duplicate filtration unit and exhaust fan are provided. An emergency power source is provided. The air pressure within the suit area is less than that in any adjacent area. An emergency lighting and communication system is provided. The internal shell of the suit area is air tight. A double door autoclave is provided for sterilization of all waste materials to be removed from the suit area.

Virus name	Hazard Group		Virus name	Hazard Group	
	Recommended	Provisional		Recommended	Provisional
<u>Group A (alphaviruses)</u>			<u>Tick-borne (cont'd)</u>		
Aura		3A	Langat		2
Bebaru		3A	Louping ill		5
Chikungunya	3B		Omsk hem. fev.		4
Eastern equine enc.	3A + vaccination		Powassan		3A
Everglades	3B + vaccination		Royal Farm		3A
Getah		3A	RSSE		4
Mayaro	3A		Tyuleniy		2
Middelburg		3A	<u>No arthropod vector</u>		
Mucambo	3B + vaccination		Apoi		3A
Ndumu		3A	Batu Cave		3A
O'nyong-nyong	3B		Carey Island		3A
Pixuna		3A	Cowbone Ridge		3A
Ross River		2	Dakar bat		3A
Sagiyama		3A	Entebbe bat		3A
Semliki Forest	2		Israel turkey meningo.		3B
Sindbis	2		Jutiapa		3A
Una		3A	Koutango		3A
Venezuelan equine enc.	3B + vaccination		Modoc		2
Western equine enc.	3A + vaccination		Montana myotis leuko.		3A
Rhataroa		3A	Negishi		3A
VEE - TC83*	2 + vaccination		Phnom-Penh Bat		3A
<u>Group B (flaviviruses)</u>			Rio Bravo		3A
<u>Mosquito-borne</u>			Saboya		3A
Alfuy		3A	Sokuluk		3A
Banzi		3A	<u>Bunyamwera supergroup (Bunyaviruses)</u>		
Bouboui		3A	<u>Bunyamwera</u>		
Bussuquara		2	Anhenbi		3A
Benque-1	3A		Batai		3A
Denque-2	3A		Birao		2
Denque-3	3A		Bunyamwera		2
Denque-4	3A		Cache Valley		2
Edge Hill		2	Calovo		3A
Ilheus	3A		Germiston		3B
Japanese encephalitis	3B		Guaroa		2
Jugra		3A	Ilesha		2
Kokobera		3A	Kairi		3B
Kunjin		3A	Lokern		2
Murray Valley enceph.	3A		Maquari		3A
Ntaya		2	Main Drain		2
Sepik		3A	Northway		3A
St. Louis encephalitis	3A		Sororoca		3A
Spondweni		3A	Tensaw		3A
Stratford		3A	Tlacotalpan		3A
Tembusu		3A	Wyeomyia		3A
Uganda S		2	<u>BWAMBA GROUP</u>		
Usutu		3A	Bwamba		2
Wesselsbron	5		Pongola		2
West Nile	3B		<u>Group C</u>		
Yellow fever	3B + vaccination		Apeu		2
Zika		2	Caraparu		2
Yellow fever - 17D*	2 + vaccination		Gumbo Limbo		3A
<u>Tick-borne</u>					
Absettarov		4			
Hanzalova		4			
Hypr		4			
Kadam		3A			
Karshi		3A			
Kumlinge		3A			
Kyasanur forest disease	4				

* Provided no more than one passage from vaccine

Virus name	Hazard Group		Virus name	Hazard Group	
	Recommended	Provisional		Recommended	Provisional
<u>Group C (cont'd)</u>			<u>Simbu (cont'd)</u>		
Itaqui		2	Oropouche		3B
Madrid		3A	Sabo		3A
Marituba		2	Sango		3A
Murutucu		2	Sathuperi		3A
Nepuyo		2	Shamonda		3A
Oriboca		2	Shuni		3A
Ossa		3A	Simbu	2	
Restan		3A	Thimiri		3A
<u>CALIFORNIA GROUP</u>			<u>TETE GROUP</u>		
California Enc.		3A	Bahig		3A
Inkoo		3A	Matruh		3A
Jamestown Canyon	2		Tete		3A
Jerry Slough		3A	Tsuruse		3A
Keystone	2		<u>UNASSIGNED - "SBU"</u>		
La Crosse		3A	Botambi		3A
Melao		3A	Gambo		3A
San Angelo		3A	Guaratuba		3A
Tahyna	2		Jurona		3A
Trivittatus	2		Kaeng Khol		3A
Snowshoe Hare		3A	Minatitlan		3A
<u>CAPIM GROUP</u>			<u>Bunyavirus-like</u>		
Acara		3A	<u>Phlebotomus fever</u>		
Bushbush		3A	Agucate		3A
Capim		3A	Anhanga		3A
Guajara		3A	Arumowot		3A
Juan Diaz		3A	Bujaru		3A
Moriche		3A	Cacao		3A
<u>GUAMA GROUP</u>			Calmito		3A
Bertioga		3A	Candiru		3A
Bimiti		3A	Chagres		3A
Catu		3A	Chilibre		3A
Guama		3A	Frijoles		3A
Mahogany Hammock		3A	Gordil		3A
Moju		3A	Icoaraci	2	
<u>KOONGOL GROUP</u>			Itaporanga		3A
Koongol		3A	Karimabad		3A
Wongal		3A	Nique		3A
<u>PATOIS GROUP</u>			Pacui	2	
Pahayokee		3A	Punta Toro		3A
Patois		3A	Salehabad		3A
Shark River		3A	SF-Naples	2	
Zegla		3A	SF-Sicilian	2	
<u>Simbu</u>			<u>Tick-borne</u>		
Aino	3B		<u>CHF-CONGO GROUP</u>		
Akebane	3B		Congo	4	CHF-Congo ^a
Buttonwillow		3A	Hazara		3A
Ingwavuma		3A	<u>GANJAM GROUP</u>		
Manzanilla		3A	Dugbe		3A
Mernnet		3A	Ganjam ^b	5	
Nola		3A	^a except West African strains which are provisional 3B ^b considered same as Nairobi sheep disease		

Virus name	Hazard Group		Virus name	Hazard Group	
	Recommended	Provisional		Recommended	Provisional
<u>Tick-borne (cont'd)</u>			<u>Kemerovo (cont'd)</u>		
<u>KAISODI GROUP</u>			Great Island		3A
Kaisodi		3A	Huacho		3A
Lanjan		3A	Kemerovo		3A
Silverwater		3A	Lipovnik		3A
<u>THOGOTO GROUP</u>			Mono Lake		3A
Thogoto		3A	Okhotskiy		3A
<u>UUKUNIEMI GROUP</u>			Seletar		3A
Grand Arbaud		3A	Sixgun City		3A
Manawa		3A	Tribec		3A
Ponteves		3A	Wad Medani		3A
Uukuniemi		2	Yaquina Head		3A
Zaliv Terpeniya		3A			
<u>Minor groups</u>			<u>Minor groups</u>		
<u>ANOPHELES A GROUP</u>			<u>AFRICAN HORSE SICKNESS</u>		
Anopheles A		3A	African horsesickness	5	
Lukuni		3A	<u>BLUETONGUE GROUP</u>		Indigenous types 2
Yacaiuma		3A	Bluetongue		Nonindigenous types 3B
<u>ANOPHELES B GROUP</u>			<u>CHANGUINOLA GROUP</u>		
Anopheles B		3A	Changuinola		3A
Boracea		3A	Irituia		3A
<u>BAKAU GROUP</u>			<u>CORRIPARTA GROUP</u>		
Bakau		3A	Acado		3A
Ketapang		3A	Corriparta		3A
<u>MAPPUTTA GROUP</u>			<u>EHD GROUP</u>		
Mapputta		3A	Epizootic hem. dis.		2
Maprik		3A	<u>EUBENANGEE GROUP</u>		
Trubanaman		3A	Eubenangee		3A
<u>TURLOCK GROUP</u>			Pata		3A
M'Poko (=Yaba-1)		3A	<u>PALYAM GROUP</u>		
Turlock	2		D'Aquilar		3A
Umbre		3A	Kasba		3A
<u>Ungrouped mosquito</u>			Palyam		3A
Rift Valley fever	5		Vellore		3A
Tataguine		2	<u>WARREGO GROUP</u>		
Witwatersrand		3A	Mitchell River		3A
			Warrego		3A
<u>Ungrouped-tick</u>			<u>Ungrouped-mosquito</u>		
Bhanja		3A	Japanaut		3A
Lone Star		3A	Lebombo		3A
Nairobi sheep disease	5		Umatilla		3A
<u>Orbivirus</u>			<u>Ungrouped-tick</u>		
<u>Tick-borne</u>			Colorado tick fever	2	
<u>KEMEROVO</u>			Eyach		3A
Baku		3A	<u>Rhabdovirus</u>		
Bauline		3A	<u>Minor group</u>		
Cape Wrath		3A	<u>KNATTA GROUP</u>		
Chenuda		3A	Kwatta		3A
			<u>MOSSURIL GROUP</u>		
			Kamese		3A
			Mossuril		3A

Virus name	Hazard Group		Virus name	Hazard Group	
	Recommended	Provisional		Recommended	Provisional
<u>Minor group (cont'd)</u>			<u>Unclassified</u>		
<u>VESICULAR STOMATITIS GR.</u>			<u>Tick-borne</u>		
Chandipura		3A	<u>DERA GHAZI KHAN GROUP</u>		
Cocal		3B	Abu Hamad		3A
Piry		3B	Dera Ghazi Khan		3A
VSV-Indiana		2	Kao Shuan		3A
VSV-New Jersey		2	Pathum Thani		3A
			Pretoria		3A
<u>Ungrouped-mosquito</u>			<u>HUGHES GROUP</u>		
Flanders		3A	Hughes		3A
Hart Park	2		Punta Salinas		3A
JoInjakaka		3A	Soldado		3A
			Zirqa		3A
<u>Ungrouped-tick</u>			<u>QALYUB GROUP</u>		
Barur		3A	Bandia		3A
			Qalyub		3A
<u>Ungrouped-no arth.</u>			<u>QUARANFIL GROUP</u>		
Kern Canyon		3A	Johnston Atoll		3A
Lagos Bat		3A	Quaranfil		3A
Mount Elgon Bat		3A			
Navarro		3A	<u>SAKHALIN GROUP</u>		
<u>Arenavirus</u>			Avalon		3A
<u>Tacaribe group</u>			Clo Mor		3A
Amapari		3A	Sakhalin		3A
Junin	4		<u>Minor gr</u>		
Lassa	4		<u>BOTEKE GROUP</u>		
Latino		3A	Boteke		3A
Machupo	4		Zingilamo		3A
Parana		3A	<u>MALAKAL GROUP</u>		
Pichinde		2	Malakal		3A
Tacaribe		3A	Puchong		3A
Tamiami		2	<u>MATARIYA GROUP</u>		
Lymphocytic chorio-	Viscero	3B	Burg el Arab		3A
meningitis	Neuro	3A	Garba		3A
<u>Picornavirus-mosquito</u>			Matariya		
Nodamura		3A	<u>NYANDO GROUP</u>		
<u>Poxvirus-mosquito</u>			Nyando		3A
Cotia		3A	<u>TIMBO GROUP</u>		
<u>Iridovirus-tick</u>			Chaco		3A
African swine fever	5		Timbo		3A
<u>Paramyxovirus-no arth.</u>			<u>Ungrouped-mosquito</u>		
Nariva		3A	Arkenam		3A
			Aruac		3A
			Bangoran		3A
			Belmont		3A
			Goroka		3A
			Ieri		3A

Virus name	Hazard Group		Virus name	Hazard Group	
	Recommended	Provisional		Recommended	Provisional
<u>Ungrouped-mosquito (cont'd)</u>			<p>Additional SALS recommendations concerning arboviruses and certain other viruses of vertebrates.</p> <p>1. Specimens for isolation of viruses should be handled at least at Containment Level 3B until the virus is identified and thereafter at its recommended Hazard Group and Containment Level. In situations where information concerning the natural human disease or the possibility of a virus restricted by the U.S. Department of Agriculture indicates that isolated viruses could be in Hazard Groups 4 or 5, Containment Levels 4A or 4B should be used for isolation and identification procedures.</p> <p>2. Viruses under investigation as candidates for use as attenuated vaccines should be handled at the same level as the parent virus until they are approved for use. Thereafter human attenuated viruses probably will qualify as Hazard Group 2 + vaccination of personnel and thus could be handled at Containment Level 2.</p> <p>3. Viruses under investigation as recombinants (reassortants) should currently be handled at a Containment Level of 3B, or higher if the parental viruses are in Hazard Groups 4 or 5.</p>		
Kowanyama		3A			
La Joya		3A			
Minnal		3A			
Nkolbisson		3A			
Okola		3A			
Pacora		3A			
Tanga		3A			
Tembe		3A			
Trinit		3A			
Venkatapuram		3A			
Wongorr		3A			
Yata		3A			
Zinga		3A			
<u>Ungrouped-various arthr</u>					
Batken		3A			
Charleville		3A			
Chobar Gorge		3A			
Dhorl		3A			
Issyk-Kul		3A			
Keterah		3A			
Matucare		3A			
Ngainingan		3A			
Nyamanini		3A			
Sawgrass *		3A			
Tettang		3A			
Upolu		3A			
Wallal		3A			
Wanowrie		3A			
Bovine ephemeral fever * 5					
<u>Ungrouped no arthropod</u>					
Almpiwar		3A			
Bangui		3A			
Bimbo		3A			
Gossas		3A			
Kammavanpettai		3A			
Kannamangalam		3A			
Keuraliba		3A			
Kolongo		3A			
Landjia		3A			
Le Dantec		3A			
Marburg	4				
Marco		3A			
Ouango		3A			
Saint-Floris		3A			
Sandjimba		3A			
Sembalam		3A			
Simian Hemorrh. fever		3A			
Tanjong Rabok		3A			
Thotlapaljam		3A			
Toure		3A			
Yogue		3A			
Ebola	4				
* A rhabdovirus					

Bases for some recommendations

1. Alphaviruses (Group A)

- a. Getah virus was classed in H.G. 3A because of viral isolations from pigs.
- b. Chikungunya was classed in H.G. 3B because our data indicate significant numbers of aerosol laboratory infections.
- c. Middleburg was classed as H.G. 3A on the basis of insufficient experiences in our survey and experimentally induced clinical disease in lambs.
- d. Semliki Forest has been associated with an equine encephalomyelitis outbreak in Senegal by retrospective serological work (Robin, Y., et al, Semliki Forest virus and equine encephalomyelitis in Senegal. *Ann Microbiol (Paris)* 125A (2):235-241, 1974). As far as SALS can determine from the abstract, there were no viral isolations nor were paired sera tested. In the absence of more definitive information, SF should probably remain in H.G. 2 - (provisional?).
- e. Una was classed in H.G. 3A because of viral isolations from horses.

2. Flaviviruses (Group B)

- a. Japanese B encephalitis virus was classed in H.G. 3B, in contrast to St. Louis encephalitis (H.G. 3A) because of viral isolations from, and severe experimental disease in, horses and pigs.
- b. Murray Valley encephalitis is classed in H.G. 3A on the basis of severe naturally occurring human disease and lethality to experimentally infected sheep.
- c. West Nile virus was classed in H.G. 3B because of overt laboratory infections disclosed in the survey and of viral isolations from, and experimentally induced encephalitis in, horses.
- d. Absettarov was classed in H.G. 4 on the basis of human disease; in addition, the virus has been isolated from goats and is experimentally lethal to sheep.
- e. Hanzalova and Hypr are classed in H.G. 4 on the basis of human disease; in addition, the viruses are experimentally lethal for sheep and/or goats.
- f. Israel Turkey Meningo-encephalitis is classed in H.G. 3B because of disease in turkeys.
- g. Negishi is classed in H.G. 3A on the basis of insufficient data and lethality to experimentally infected goats.

3. Bunyamwera

- a. Kairi is classed in H.G. 3B because of viral isolations from, and clinical disease in horses/donkeys.

- b. Maguari is classed in H.G. 3A because of viral isolations from horses.
4. Group C
- a. Many Group C viruses were classed in H.G. 2 because they produced mild, self-limiting disease and the laboratory infections disclosed by the survey were non-aerosol.
5. Simbu group
- a. Aino is classed in H.G. 3B because it produces fetal deformities and abortion in sheep and cattle.
 - b. Akabane is classed in H.G. 3B because it produces fetal deformities and abortions in sheep and cattle.
 - c. Ingwavuma, Sabo, Sango, Sathuperi, Shamonda and Shumi are classed in H.G. 3A because of viral isolations from cattle, sheep, goats, or pigs.
6. Phlebotovirus fever group
- a. Sandfly Fever (Sicilian and Naples) viruses are classed in H.G. 2 because they produce mild self-limiting human disease and infections are non-aerosol. Naples, however, does not have sufficient laboratory experiences reported to warrant H.G. 2 classification under the standards we set.
7. Tick-borne bunyavirus-like
- a. Dugbe virus is classed in H.G. 3A because of viral isolations from cattle.
 - b. Ganjam virus was classed in H.G. 5 because it is serologically indistinguishable from Nairobi Sheep Disease.
 - c. Thogoto, Bhanja, and Tribec viruses are classed in H.G. 3A because of viral isolations from cattle, sheep, and/or goats.
8. Rhabdovirus
- a. Cocal has been associated with disease in horses and pigs (Federer, KE et al, Res Vet Sci. 8:103, 1967. Insufficient experiences with overt laboratory infections (aerosol?) support 3B for Piry.